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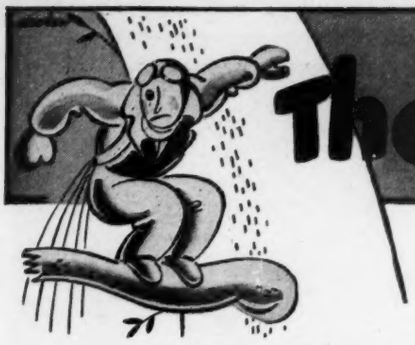

The Birdmen's Perch

Quite a few of you fellows who send in contributions to The Perch forget to put your street address on your letters, and we have the devil's own time getting in touch with you. We often want to make further inquiries, so do old "Tattered Wing Tips" a good turn and put your address down when you send along your stuff.

MAJOR AL WILLIAMS, alias "Tattered Wing-Tips," *Mgr., Aviation Dept.*, Gulf Aviation Products, Gulf Building, Pittsburgh, Pa.

THE HE-MAN OF DEATH VALLEY

Back in 1929 I was working at a California airport which had one of the oddest collection of aircraft antiques on the Pacific coast.

But one day there staggered in the prize of them all, a Tommy Morse One-Place Trainer of wartime vintage. It had a Le Rhone rotary engine.

Now, the pilot claimed he had 400 hours on the Le Rhone without a forced landing. I thought he was an awful liar, but a look inside the cowl showed that he was giving me the straight dope. It was lined with castor oil sludge half an inch thick and baked on hard.

The he-man who flew this jallopy that long, did so over *Death Valley!*

I mention this story because some of our modern he-man operators think they're doing well when they operate a modern engine 500 hours without grief.

I wonder how long the Le Rhone really would have functioned if it had had the expert attention of motor specialists and such good oil as Gulf puts out?

WILLIS L. NYE, Burlingame, Calif.

GAS DEALER WINS $14,400

Half the birds we know dream of winning a fortune on the Sweepstakes, but it took Rudy Kling, gas station operator from Lemont, Ill., to really clean-up.

Rudy, as you know, was the big surprise at the National Air Races. In a plane of his own design, he won the Thompson and Greve Trophy Races, and $14,400.

It is a pleasure to Gulf that Rudy used Gulf Aviation Gas and Gulfpride Oil in his plane.

HE MISSED THE HEARSE AGAIN

That newsreel cameraman whom the Cubans took pot shots at (see August Perch) must be the same one I know.

On that same Cuban trip "Al" told about, this guy heard that there's a big-shot rebel's funeral going on in another part of the island, so he rushed out to the Havana airport pronto.

Here he yells for somebody to fly him to the spot where the funeral is to be, and out runs a chap in uniform. He grabs the controls of the nearest ship and the cameraman climbs in with him.

The ship lurched drunkenly up the runway and finally nosed up into the air. After they get off the ground, the pilot explains that he's never flown a ship before, just ridden a few times. He's a rebel who wants to get out of Havana *toot sweet*.

The rebel and the cameraman (who'd done lots of flying, but no piloting) finally did get the ship landed at the right spot. But they were too early for the funeral. The Cuban in the ship was, believe it or don't believe it, the big-shot rebel who was supposed to be dead.

V. B., New York City

THIS MONTH'S WHOPPER

Dear Gents: Chuck Feldman had the biggest mouth in the world. Which is how come he got et by a grizzly bear. And the only reason that same bear ain't pickin' pieces of me out of his teeth is "Gulf Aviation Gas."

You see, we run out of gas in the mountains, and had to walk four-five mile to a fillin' station. All we had to tote gas in was my canteen.

The mountains hereabouts is full of small caves. We're half-way back to the car, with me clutchin' this canteen of Gulf, when out of a cave comes this bear.

Chuck, thinking real quick-like, squats down on his heels and opens that big mouth of his as wide as he can. The bear decides he's just another cave, and leaves Chuck squattin' there while he takes out after me.

He's gainin' on me, too, real steady an' annoyin', until I uncorks my canteen and takes a swig. When that Gulf hit my insides, I went about ten-twelve feet in the air and come down a-runnin'. I started across them hills, knockin' down trees an' tearin' up bushes somethin' scandalous. The Forestry Service is still writing me letters.

Well, gents, inside of three minutes, I'm passing Ponca City, fourteen miles away. After the effects of that Gulf wore off, it took me two and one-half days to walk back.

Sincerely yours, *Bill Gray.*

P.S. Oh, yes: I near forgot Chuck. He is still holding his mouth open when the bear gets back from chasing me. It worked swell, too; up until the bear decided that was the cave he wanted to live in.

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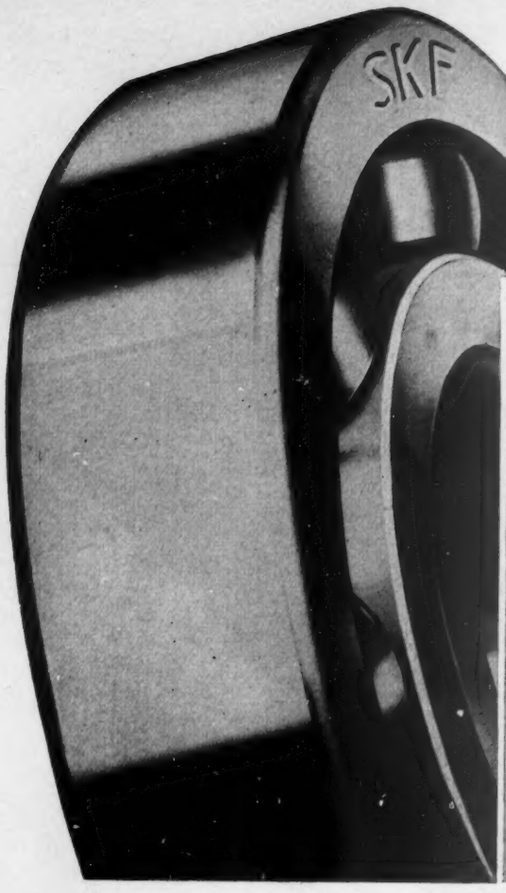

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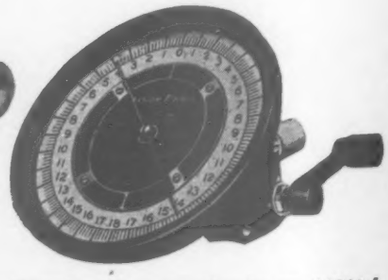

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Flashes

From the Skyways of the World

» To BERMUDA AGAIN, this time on board Imperial Airways "Cavalier,"—and we must say that we have never experienced more comfortable flying in anybody's airplane. Going aboard into the spacious cabin, with its high ceilings, large windows, promenade deck, and its exceedingly comfortable chairs, gives one the feeling that here is a real step toward the type of passenger accommodation that must be a part of every long-range ship of the future. The promenade idea deserves special mention and warrants careful attention by all operators and designers. On most ships one hesitates to do much casual strolling up and down center aisles, even where head room and width may be adequate, but it is the thing to do on the Empire boats. In the main cabin section all seats are concentrated on the starboard side of the ship, leaving the port side free. Furthermore, the windows on that side are raised above normal seat level and a rail is provided underneath, at just the proper height for elbow-leaning. One may stroll or may stand against the rail, looking out over sea-and-cloud-scapes in the best cruise ship tradition. Its a swell idea.

We were doubly glad to have had the opportunity of making the Bermuda run with Captain Cumming and "Cavalier" for it gave us another brief respite from the winter that is presently upon us,—and especially because we had seen the "Cavalier" under construction at the Short factory in Rochester, England, last year and it gave us a chance to see something of her behavior in action.

» DOWN AT R.C.A. in Camden, Dave Little is afraid to go to lunch. Several times he has come back to his hangar and found yawning gaps where his demonstration models were set up earlier in the day. No, it isn't grand larceny; only the sales department desperately trying to fill the many rush orders that are swamping the place. Fortunately, on our recent visit, the sales boys hadn't gotten around to stripping the Waco Dave uses to convince the customers, so we were treated to a very pleasant demonstration flight. We landed with a new appreciation of the usefulness of complete radio equipment in private airplanes.

» ON THE WAY DOWN TO CAMDEN we stopped off to see Carl de Ganahl and Bill Sutton at Fleetwings. There we got a look at the new Seabird which we plan to describe in an early issue. Fleetwings is doing something—building house trailers. From what we know of the trailer industry (and we have been watching it with great interest) the Fleetwings product represents a lot of trailer for the price. And they are the kind of trailers anyone would enjoy living in. Other aircraft manufacturers might consider looking into this field as a means of smoothing out low spots in airplane production.

» WE COULDN'T GO TO BRISTOL without stopping in at the Hall Aluminum Plant although we knew in advance our visit would be saddened by the absence of the founder, Charles Ward Hall, whose untimely death last year

In This Issue

After several strenuous weeks in the East visiting air races, air lines, airports, etc., our West Coast Editor got back to his own bailiwick in time to jump right into the S.A.E. aircraft production meeting. We take-off this time with his resume of program and papers . . . Pictorial record of how the Douglas plant knocks out DC-3s. . . . Don Luscombe pulls a pack of new production ideas "out of a hat" . . . Back recently from five years in South America, H. T. Bylor gives some useful hints on how to sell airplanes in the Americas "down under" . . . T. C. Bennett is a new contributor. Although he is a member of the engineering staff of the Naval Aircraft Factory in Philadelphia, his views on the effect of time on loading conditions on aircraft are his own as an individual, and do not reflect any official Aircraft Factory opinions . . . The frontispiece of this issue was made from an infra red photograph taken by Mr. Joseph George, Chief Meteorologist for Eastern Airlines at Candler Field, Atlanta . . . A new department, Aircraft Radio, which will be run by our radio advisers, Keith Henney and Donald Fink, respectively editor and managing editor of another McGraw-Hill Company publication—"Electronics."

How to Achieve

HOMOGENEOUS METAL STRUCTURES *and* PERFECTLY SMOOTH SURFACES

BEING WELDED, *this wing section is already a single homogeneous metal unit. And when the complete plane is assembled—wings, motor supports, fusilage and landing gear will similarly be welded together into one metal unit.*

• • •

WITH NO RIVET-HEADS *to interrupt the airstream, stainless steel construction reduces skin friction to its apparent minimum.*

A LEADING authority in aircraft design recently listed six important and basic trends in aeronautical development. Among these six he mentioned two which refer directly to the plane's construction — more homogeneous structures and smoother surfaces.

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UNITED STATES STEEL

shocked everyone. But company traditions are being carried on well by Archibald M. Hall and Charles F. Pape. Among the many interesting projects underway is an overhaul job on several Coast Guard boats that have been in continuous service for a number of years. When the structures were examined it was found that practically no corrosion had taken place in spite of the fact that the boats had been used exclusively in salt water operation.

» AT TRENTON we went over to see Don Luscombe, his bird dogs, his airplane and his plant. Don has an entirely new solution to the problem of quantity production which furnishes food for thought for all private airplane manufacturers. He tells his story on page 28 of this issue.

» OF COURSE we couldn't resist a look-in at the New Jersey State Fair while we were in Trenton. We had no sooner gotten inside the main gate when we bumped squarely into Al and Mrs. Bennett who had picked up the best spot on the fair grounds to exhibit a Cub and tell the world about it with neon signs and a loud speaker system. On page 50 is a photograph we took of the exhibit. Other progressive airplane distributors please copy.

» OVER NEAR THE PHILADELPHIA AIRPORT we dropped in on Wallace Kellett and Fred Prewitt who are busy building autogiros for the Navy. Fred has come back from his recent trip to Europe full of new ideas about giros. Among other things he reports that the French are building one that weighs 3400 lb. which giroists are watching with great interest.

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"Maguire's grounded for stunting last Saturday night!"

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How to Achieve

HOMOGENEOUS METAL STRUCTURES *and* PERFECTLY SMOOTH SURFACES

BEING WELDED, *this wing section is already a single homogeneous metal unit. And when the complete plane is assembled—wings, motor supports, fusilage and landing gear will similarly be welded together into one metal unit.*

• • •

WITH NO RIVET-HEADS *to interrupt the airstream, stainless steel construction reduces skin friction to its apparent minimum.*

A LEADING authority in aircraft design recently listed six important and basic trends in aeronautical development. Among these six he mentioned two which refer directly to the plane's construction — more homogeneous structures and smoother surfaces.

U·S·S Stainless Steel in special aircraft grades offers an excellent means to achieve these two important objectives.

Since stainless steel construction can be welded, the entire plane — wings, motor supports, fusilage and landing gear—can be made one virtually homogeneous metal unit. There are no rivets to loosen. No rivets to open. No rivets to vibrate. And since there are no rivet-heads to interrupt the airstream, smoother surfaces can be obtained and skin friction reduced to its apparent minimum.

Stainless steel construction also offers other important advantages. The high tensile strength of the metal and the designer's freedom to use more efficient structural sections with a higher moment of inertia, make possible a strength-weight ratio higher than that with any other metal. And safety is increased, since stainless steel is impervious to weather and cannot weaken or deteriorate with time.

Stainless steel construction offers to aircraft designers an interesting opportunity to build new planes which are lighter *AND* stronger, faster *AND* safer. Our nearest sales office will gladly supply full information on the properties of the wide range of special grades of U·S·S Stainless Steel for aircraft construction.

U·S·S STAINLESS STEEL

AMERICAN STEEL & WIRE COMPANY, *Cleveland, Chicago and New York*
CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*
NATIONAL TUBE COMPANY, *Pittsburgh*

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

shocked everyone. But company traditions are being carried on well by Archibald M. Hall and Charles F. Pape. Among the many interesting projects underway is an overhaul job on several Coast Guard boats that have been in continuous service for a number of years. When the structures were examined it was found that practically no corrosion had taken place in spite of the fact that the boats had been used exclusively in salt water operation.

» AT TRENTON we went over to see Don Luscombe, his bird dogs, his airplane and his plant. Don has an entirely new solution to the problem of quantity production which furnishes food for thought for all private airplane manufacturers. He tells his story on page 28 of this issue.

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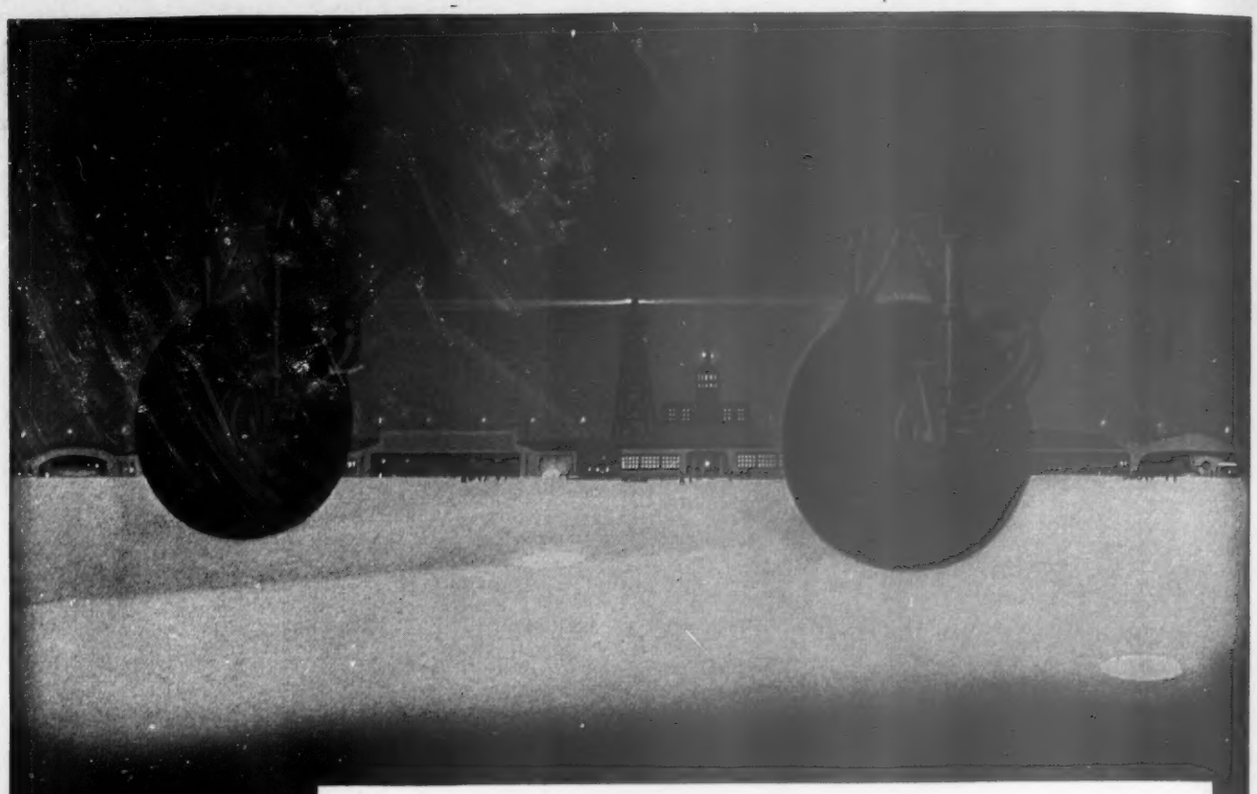


Consultation

An excellent suggestion, made by one of our technicians, just late enough to involve a sizable change-over-expense, was accompanied by the remark, "It wasn't in our department, and I didn't like to bother those fellows before."

The statement made us wonder . . . have we been reluctant in urging consultation between aircraft engineers and our own technicians who are specialists in brake, wheel and shock-strut design and construction?

There's more opportunity to incorporate good suggestions during the early stages of design than later when plans have "jelled." Why not consult Bendix *before* the next undercarriage is laid out?

BENDIX PRODUCTS CORPORATION

AIRPLANE WHEEL AND BRAKE DIVISION

(Subsidiary of Bendix Aviation Corporation) South Bend, Indiana

BENDIX

AIRPLANE WHEELS · BRAKES · PILOT SEATS · PNEUDRAULIC SHOCK STRUTS

Side Slips

By
ROBERT OSBORN

» "To discover a Roman villa believed hidden under the earth near Angmering, England, a flyer has been employed to scout for it from the air. Not long ago a Roman bath was uncovered in this area."—*News Item.*

Come, come, Johnny Bull! You're just letting affairs in Spain and the Mediterranean get you down. Mussolini probably had nothing to do with the construction of that bath, or the villa either.

» Considering the trials and tribulations of the manufacturers of military aircraft in attempting to make deliveries to foreign countries before embargoes are put in effect, we wouldn't be surprised to read a news item something like the following along about 1950:

"Today authorities opened twenty five mysterious cases which were found lying in an obscure corner of an old pier in San Pedro, California. The shipping cases were labeled 'Military Airplanes' but the name of the manufacturer had been obliterated. Markings on the boxes indicated that they had first been consigned to the Spanish Loyalist Government in 1937, then to the Chinese Nationalists and then in rapid succession to all other nations of the world except the Duchy of Luxemburg. The boxes contained nothing but corroded and rusty metallic dust, and badly yellowed and faded sheets of paper giving instructions, in thirty seven languages, for assembling the machines."

» We are very glad to report to Aviation readers that these here, now, swashbuckling aviator fellers are still managing to pick off a fair percentage of the beautiful actresses and heiresses for wives. This in spite of the continued attempts by insidious forces to take all of the romance out of aviation by devious and underhand methods. Several of these attempts we have called to your attention recently, such as the design of a new airplane to spread fertilizer on large farms, and the order to Army aviators to remove all false teeth before starting flights.

» Speaking of romance in aviation, there's another activity in the business lately of which we do not entirely approve—the definite trend toward simplicity. Elimination of the rudder control, single-blade propellers, automatic spark and mixture controls, monoplanes instead of biplanes, and so on.

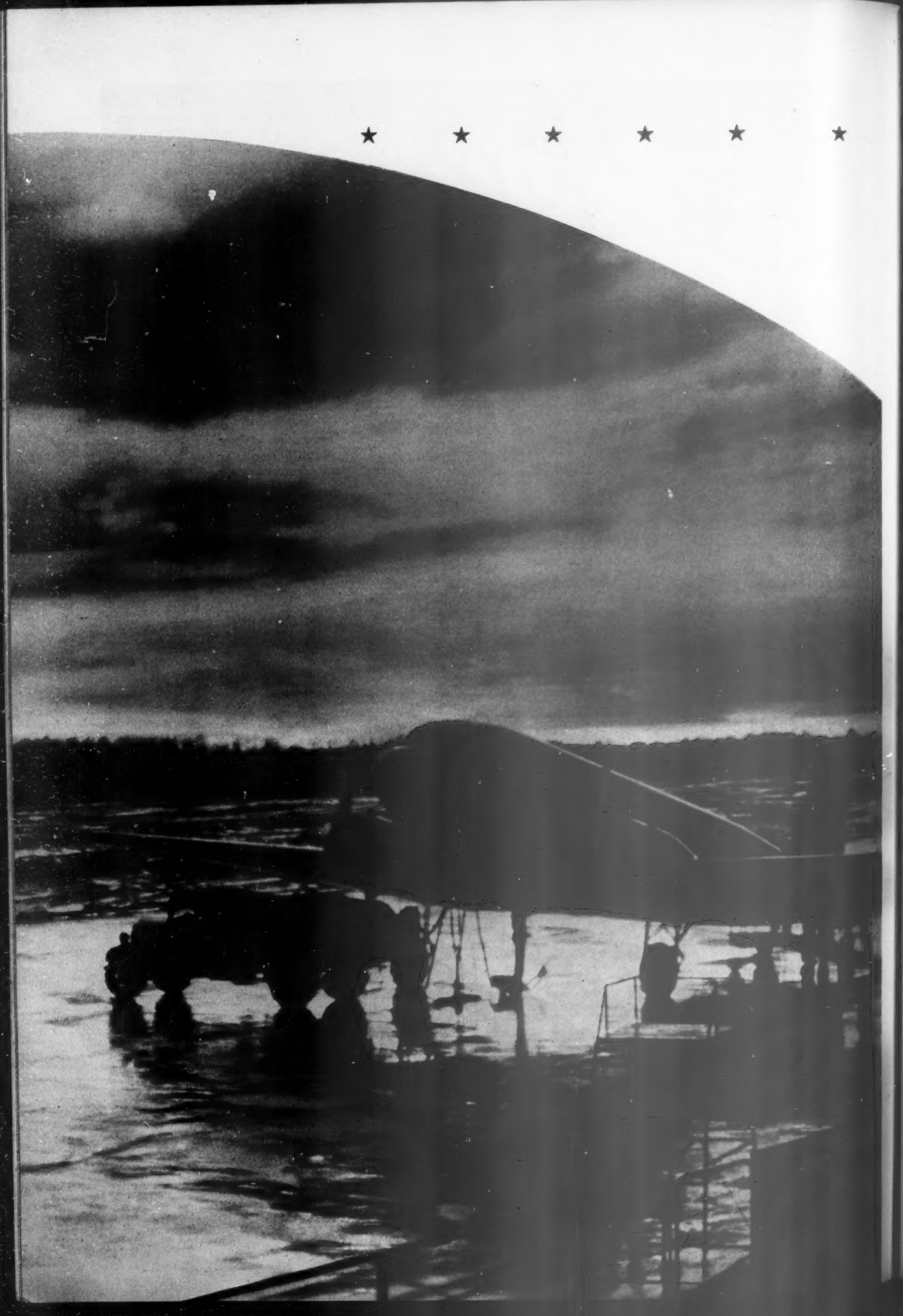
As a youth we had the greatest of admiration for the Stutz "Bearcat" automobile which had four cylinders as big as beer kegs, no muffler, a dashboard covered with instruments and levers, and two tremendous gear shift and brake levers mounted on the outside of the cockpit. We hoped some day to own a special one of these cars with a gas lever as big as a locomotive reverse lever, whereas we now drive one of the "all three low-priced cars," which is as simple, and as romantic, as a wheelbarrow.

Of course all of this simplicity is essential to the future of the business if we hope to have the general public flying and buying, but an old sentimentalist must be allowed to shed a few tears for the rapidly departing romance of flying. Our last stronghold of complexity, and concomitant romance, is the transport plane, in the flying of which a pilot needs all of the dexterity of a pipe-organist, but first thing you know they'll be making those planes simple too.

» The old saying that "You can't improve on Nature" certainly gets knocked around once in a while. A United Press dispatch states that thousands of swallows which were stranded in Austria due to premature cold weather and rain had been collected in cages and were being flown by airplane to their winter homes in the south.

» Mrs. Doris Duke Cromwell, who is reported to possess a number of millions of Mr. Roosevelt's fifty-nine cent dollars, and her husband, James H. R. Cromwell, who is not badly off financially himself, recently announced their plans to "commute" by air between the 2,400 acre estate in New Jersey and their new home in Honolulu.

Air lines might well appoint Vice-Presidents in Charge of the Cromwells.



ANOTHER WINTER

ONCE AGAIN the sun has swung away from our northern latitudes and we stand on the threshold of another winter. The average citizen is renewing his acquaintance with his coal bin, is shaking the moth-balls out of winter overcoats, and is dusting off his ear-muffs. And so the airlines,—carburetor heaters (and other defrosting devices) are going in, wing and tail overshoes are being fitted, and anti-static "ear-muffs" are being applied to radio antennas.

Never before has such an array of practical gadgets been at hand to help lick the problems of winter operation. Each one represents a vast outlay of brains, energy, and money, but each is essential for safe operation regardless of cost. The whole industry may well be proud of the way in which all its departments have risen to the occasion when called upon to meet some new and unexpected problem cropping up in actual operations. We've gone a long way in a short time.

But, while taking pride in accomplishment, it is much more important to remember that, after all, these things are only mechanical devices,—that they can't do much thinking for themselves. At best, they can be only the tools with which we as human beings may work toward greater safety. The old automobile gag that safety depends mostly on "the 'nut' that holds the wheel" still holds good.

Here, however, we are not thinking particularly of pilots. Far from it,—for the wheel of responsibility that guides the destiny of our air transport is a much bigger one than any found in cockpits, and hundreds of hands are holding it. From mechanic's helper to top executive, every man in the business has a hand on it. In no other line of group endeavor is responsibility for ultimate performance so widely spread. Probably in no other industry can individual mistake or misjudgment have such far-reaching and such disastrous results. We have said that before, and we will make no apologies for saying it again as frequently as possible, for the recognition of the concept of shared responsibility is the only solid foundation for safety in all aviation activities.

Once the principle of divided responsibility is accepted, a full-blown corollary immediately pops up,—to wit: intelligent cooperation among all groups is essen-

tial. Here again we are covering a broad field. To the obvious need for cooperation among pilots, dispatchers, weather men, engineering and mechanical personnel within any given organization must be added the greater need for closer and closer cooperation among the several operating companies themselves. Competition may make for a healthy state of affairs in business generally, but if carried to extremes, or applied in the wrong spots, may easily prove to carry with it the germs of self destruction.

With the coming of winter this year air transport is facing what is probably the most critical period of its history, not excepting the debacle of 1934. The reverberations of the tragic winter of 1936 are still echoing in the minds of the travelling public. The traffic figures for this year, although better than for any prior period, show unmistakably the depressing effect of last year's accidents, and it is safe to say that the volume of business that can be developed for 1938 and 1939 will depend to a considerable degree on the performance in terms of safety of this winter's operations. Even under the best of circumstances the going is not going to be too easy in the next couple of years. The competition from other forms of transportation is getting much keener, what with the improved speed and comfort of the railroads and bus lines, coupled with their extremely low fares. And with Douglas DC-4s, Boeing 307s, and possibly other types of much larger machines in the offing, many more seats must be sold to maintain occupancy percentages at an economic level.

So, it all boils down to one thing. If air transport is to move ahead into its proper place there must be no repetition of the events of a year ago. Further than that,—there must not be a single accident on any airline during the winter of 1937–38. It can be done, and it will be done if all agencies, governmental and private,—if all individuals from top to bottom,—keep forever before them the recognition of personal responsibility and subordinate all other interests to the single objective of Safety through Cooperation.

As we go to press, comes word of the loss of an airliner in the West— lending tragic emphasis to the above remarks on the need for utmost care in all operations in the months immediately ahead.

A SHOW FOR '38

WHEN WE ASKED THE INDUSTRY (by questionnaire) in May this year whether or not aircraft shows were a good thing, 86 per cent of the people who replied declared themselves in favor of annual exhibitions. Over 90 per cent wanted shows to be national in character, and the majority pointed out the desirability of a central location. (AVIATION, July, 1937, p. 18).

Now we are about to get a show that conforms almost exactly in specification to those written by the industry itself,—The International Air Show scheduled for January 28 to February 6. It comes early enough in the year to precede the active buying season, thus focusing attention on 1938 models; it is definitely national in character, with Class A sanction by the Aeronautical Chamber of Commerce; it is centrally located in Chicago's International Amphitheatre. Along with it will be held a number of meetings of general industry interest, among them a national gathering of fixed base operators to concentrate on some of their common problems.

Already an active interest is manifest throughout the industry in the Chicago project, but like all other efforts of the sort, it will be a success only if all those who voted favorably in the spring turn out and back up their expressed desires with active support. There is an opportunity here for the American aviation industry to really show what it can do on a scale comparable to that of the great European salons of Paris and Milan. Let's go!

THE THREE WHEELERS

IF ANYTHING that looked like a trend cropped up at the Cleveland Races this year, it was the re-emergence of the tricycle landing gear. Gwinn's Aircar, Waterman's Arrowbile, the Stearman-Hammond, and the new Waco N were all nose-wheelers, and probably by this time next year the tricycle mounted transports of the DC-4 class will be familiar sights on many of our airports. We were much interested, for we have felt for a long time that there was real merit in the idea. And we like to think that we helped the cause along a bit by publishing such articles as Frank Courtney's "Nose Wheels" (December, 1935), Fred Weick's description of his W-1 (January, 1936), and Shanley's "Tail Wheel or Nose Wheel" (June, 1936). Also, AVIATION's survey of the industry on the specifications for the ideal light airplane ("This Light Plane Business," December, 1935) disclosed a very great interest in the arrangement by manufacturers and users alike.

The appearance of the tricycle gear, and the current crop of unconventional airplanes, seem to point up the fact that, for better or for worse, airplane designers are again letting their minds run free of accustomed tracks and are beginning to let them ramble a bit at will in unexplored territory. A good thing, we call it.

Camera's Eye on the News

1. Boeing flying fortresses feature the Air Corps' show above the American Legion's Fifth Avenue Parade.

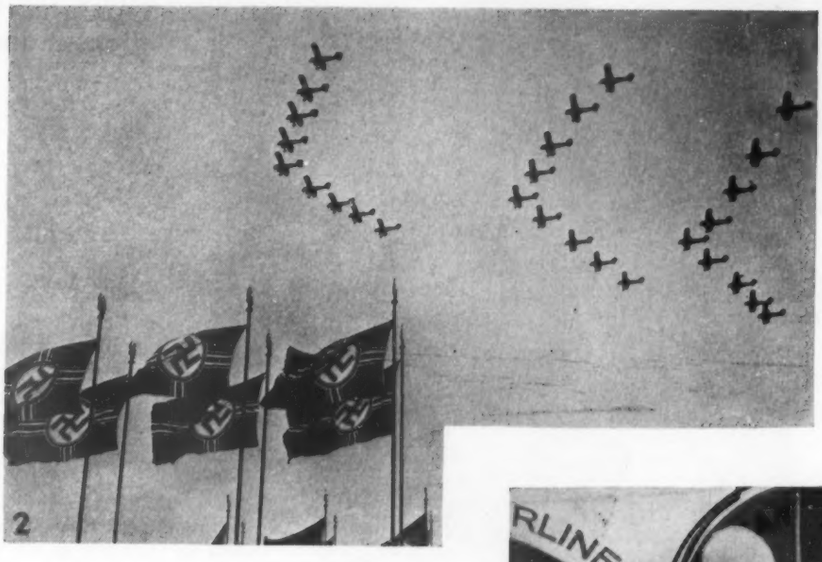
2. German squadrons fly past the reviewing stand at the Nazi's huge Nuremburg display as. . . .

3. . . . . Goering, Mussolini and Hitler look up.

4. Sir Hubert Wilkins, after weeks in the Arctic searching for Levanevsky, returns to New York to get landplane equipment for this task.

5. Charles Gardner, flying the Mew Gull No. 4 in the foreground, wins his second straight Kings Cup Race. Speed: 233.7 m.p.h.

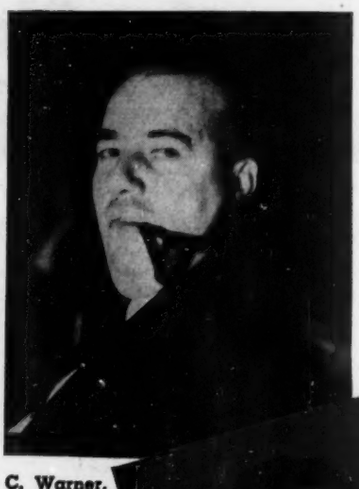
6. The Mayo Composite is at last composited. Both elements have been pronounced ready for their teamed-up tests.



RATIONALIZING

Aircraft Production

1937 S.A.E. National Aircraft Production Meeting brings better understanding of aviation industry methods.



John A. C. Warner, S.A.E. General Manager.

Dr. A. L. Klein, chairman of the Thursday evening meeting.

CONTINUING THE TRADITION OF SUCCESS ushered in by the inaugural production meeting of 1936, the 1937 National Aircraft Production Meeting sponsored by the Society of Automotive Engineers, drew engineers and executives from all branches of the aviation industry to the seven sessions held at the Ambassador Hotel, Los Angeles, on Oct. 7, 8, and 9. Again, as in 1936, the sessions were jammed morning, noon, and night with capacity crowds. This in spite of the current World Series broadcasts, and the football classics of Saturday afternoon. A list of the 700 persons who registered officially would read like a Who's Who in aviation engineering, and merely to list all the firms represented would require cataloging the entire industry.

Truly national in its scope, the meeting drew nine of its fifteen papers from east of the Mississippi. Cooperating with the national S.A.E. body were the four Pacific Coast S.A.E. sections, headed by the Southern California Section under the chairmanship of W. B. Birren, Western Representative of the Wright Aeronautical Company. S.A.E. president Harry T. Woolson, executive engineer of Chrysler Corp., was in personal attendance. Past S.A.E. presidents Wm. B. Stout and Edward P. Warner repeated their roles of 1936, the former as master of ceremonies at the Annual Banquet, and the latter making the presentation of the Wright Brothers Medal for 1936. Carleton E. Stryker, Chief Engineer of Curtiss-Wright Technical Institute, again served as general chairman of the meeting, carrying the major burden of planning the details responsible for such outstanding success.

Climaxing the aviation industry's first peace time $100,000,000 production year, with aircraft orders running twenty five per cent ahead of 1936 and with backlogs throughout the industry at new high for 1938, the meeting properly focused thought on the production problems peculiar to the aviation field. Mutual problems were discussed with commendable frankness by those in attendance. The keynote of such mutuality was struck by John A. C. Warner, S.A.E. General Manager, with the comment, "It is not a matter of sharing secrets but of avoiding economic waste."

Although the Wright Medal this year was presented for a paper read at the 1936 Production meeting, it became evident early in the current sessions that the papers offered were more representative, and the coverage of the aviation production problem was more comprehensive, than last year. Particularly gratifying was the obvious appreciation of those in attendance that production means something entirely different in aviation than it has come to mean to automobile men. This was well put by D. M. Carpenter, of the Consolidated Aircraft Corporation, in his paper on Factory Equipment and Tooling with the following comments:

"By far the most outstanding feature to be noted in connection with aircraft factory equipment and tooling is its general inadequacy. . . . aircraft factory budgets are limited by the comparatively small size of airplane contracts. . . . The factory executive, therefore, must be con-

stantly on the alert to avoid letting his knowledge of mass production possibilities run away with his judgment concerning the expenditures allowable for equipment and tooling. . . . Experience shows something on the order of an average of two duplicate parts per airplane. . . . Regardless of the best laid production plans, changes in design and specifications are imposed so often that it is doubtful if two absolutely identical airplanes ever leave the factory."

Also highlighting the meeting were the comments of operators, both civil and military, stressing the importance of producing airplanes that can be easily and cheaply maintained and overhauled. Operators properly made the point that original designers frequently have little appreciation of overhaul problems and methods. This focusing of attention of the designer on overhaul problems struck one as being a milestone of more than usual significance on the road of aircraft design development.

Now it is obvious that we are entering a design and production era where the greatest attention is to be concentrated on designing and building equipment which will achieve a maximum life with minimum maintenance attention and the utmost susceptibility to complete rebuilding by the operator. Now, with routes crystallized and a relatively heavy volume of passenger, mail and express traffic assured, the engineers can turn their guns on the multitude of design problems concerned with keeping airplanes in the air more hours per day at less dollars per hour.

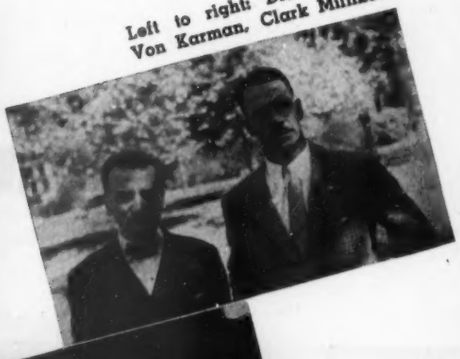
Not all of the sessions were purely technical. At the Thursday evening meeting an informal and impromptu talk given by Edward R. Hewitt was enjoyed intensely by the large group in attendance. Hewitt, now 72 years of age, is consulting engineer for the Mack Truck Co., and was one of the original founders of the Society of Automotive Engineers. He inspired his audience with a comparison of transportation progress made in his own lifetime. Attending with E. R. Hewitt was his son Ashley C. Hewitt, chief test engineer for Menasco Manufacturing Company.

Also of outstanding interest was the visit to the California Institute of Technology. Under the director of W. C. Rockefeller, Caltech aeronautics professor, a group was shown through the aeronautics laboratory and wind tunnel, high tension electrical laboratory, hydraulics laboratory, and the optical laboratory where grinding work on the 200 in. telescope mirror is

(*Turn to page 67*)

One of the visiting groups at the sessions.

Left to right: William B. Stout, Donald Wood, T. P. Wright.



Left to right: Dr. Theodore Von Karman, Clark Millikan.

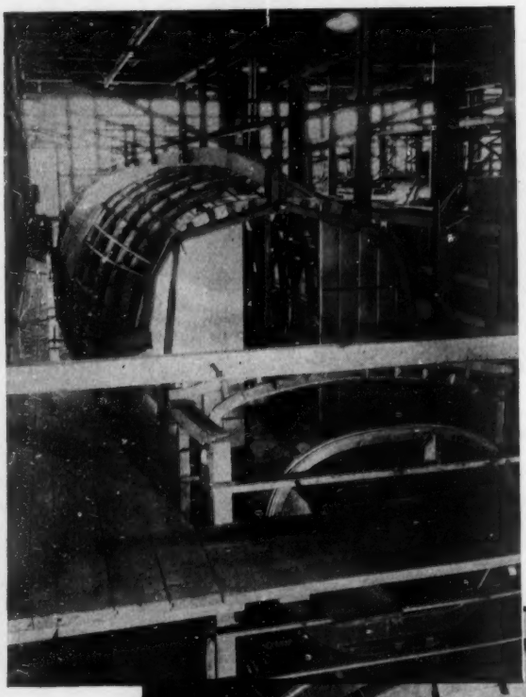
Left to right: Edward R. Hewitt, Ashley C. Hewitt, Carleton E. Stryker.

W. C. Rockefeller talks to a part of his visiting group.

All Douglas planes originate here in the Douglas engineering department, so large that it is laid out in aisles and sections like a city map, and with loud speakers for communication purposes.

Turning Out DC-3's

From Drawing Board to Final Assembly



Douglas DC-3 fuselages are fabricated in this two story jig permitting men to work inside and out simultaneously on two levels.

DC-3 powerplant sections are assembled complete from firewall forward on these portable assembly jigs and are then rolled out to the final assembly bay for hoisting to position on the plane.

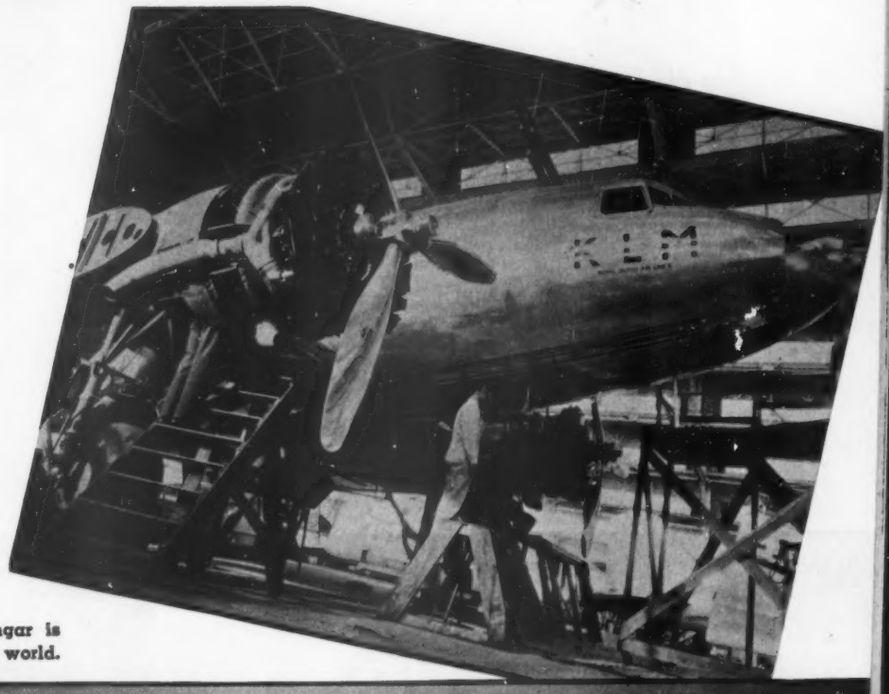
Interior of the DC-3 fuselage structure as it leaves the primary jig.

The completed DC-3 fuselage is mounted on a dolly and starts down the assembly line.

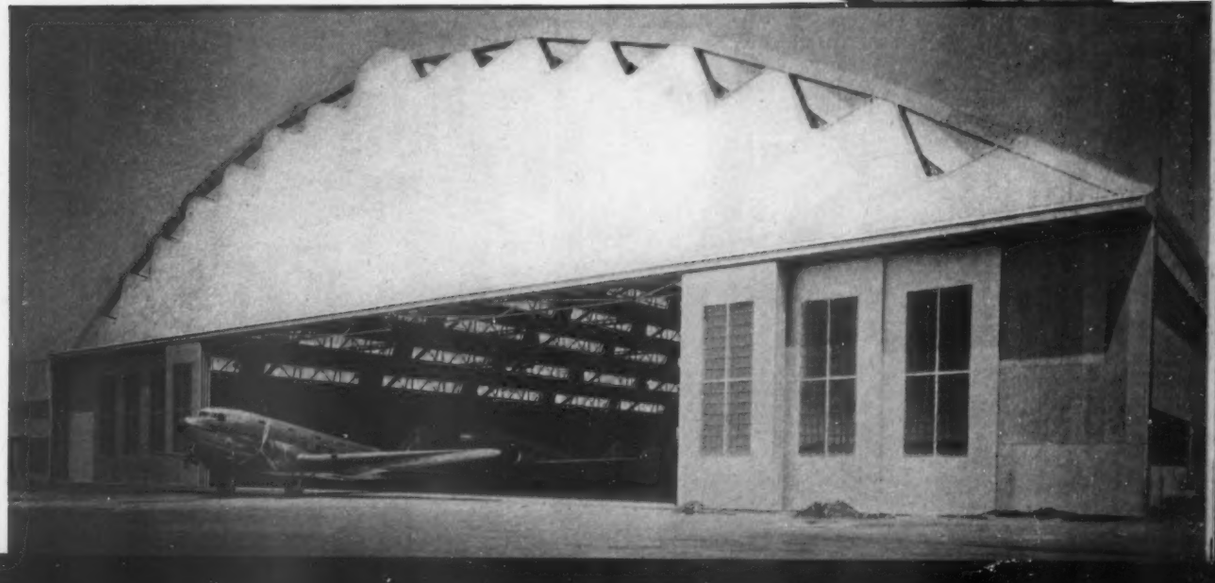
Below: Wing department where DC-3 wing panels are assembled on vertical jigs.

Line of DC-3 fuselages on dollys in foreground. In background the planes near final assembly with attachment of center section, landing gear, wings, etc.

Here the DC-3 is in the final assembly bay where it is receiving engines, instruments, landing gears, and all accessories.



The great Douglas single-arch hangar is the largest airplane hangar in the world.



By Don Luscombe
President, Luscombe Airplane Corporation

Out of a **Hat**

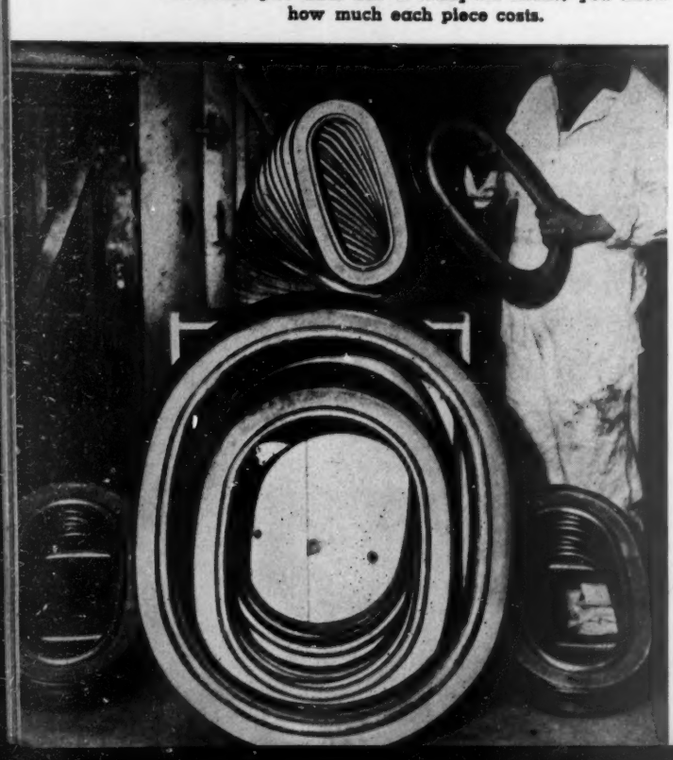
Don Luscombe pulls airplanes out of a vest pocket factory as easily as a magician pulls rabbits out of a hat. Here is how he does it.

MAYBE IT WAS back in the long lean years of the depression that we got to playing with a child's construction toys and decided that the Meccano-Erector principle was the way to build airplanes. Anyway it must be charged to the depression because twenty years of previous exposure in the airplane business had not brought out the right idea.

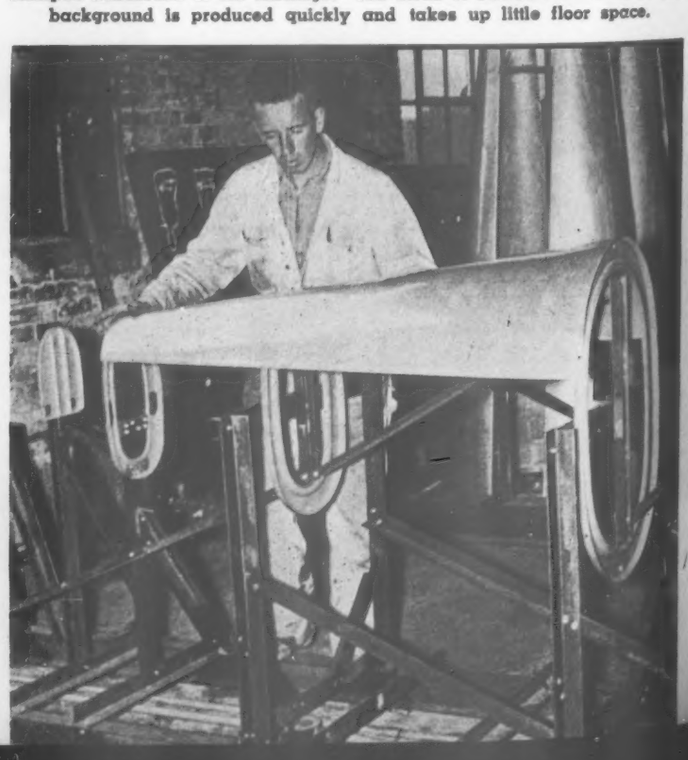
But getting back to the Meccano. There it was in a compact little box with all the necessary parts to build skyscrapers, bridges, locomotives, or what have you. And any normal twelve year old could put them together. Translate into manufacturing terms and you have a small factory and small overhead. You let the specialist manufacturers buy the expensive machinery and fancy talent for such operations as extrusions, stampings, forgings, and all the other metal forming operations that the small manufacturer of airplanes has no business attempting to duplicate.

After airplanes or Meccano sets are designed and built by hand, tested, and rebuilt, then comes the task of

Stamped bulkheads for twenty-five fuselages go into this small pile and, like a ready-cut house, you know how much each piece costs.



In this small corner of the plant preformed sheets are quickly riveted to stamped bulkheads of the fuselage. The stock of standardized tails in the background is produced quickly and takes up little floor space.



designing the dies and tools for specialist machine operations. Hundreds of parts must line up. Rivet holes must jibe. Progressive effort in tool-making is required. One die is dependent on the die that preceded it. Owning all of the king's horses and all of the king's men may be a gratifying luxury, but it won't substitute for the required time element to make parts fit. Somehow it seems to take a hen twenty-one days to hatch the egg but twenty-one hens are not much help in getting the egg hatched in a single day.

A careful survey of one's friends will reveal a woeful lack of appreciation or knowledge of the supercraftsmanship necessary to make a forging die or a casting die, which, when put into a machine operated by unskilled hands, produces certain items which can be purchased for a few cents. Of course when one is properly tooled and organized one can assemble toy sets or airplanes out of a vest pocket organization about as fast as a magician pulls rabbits out of a hat. It sounds very simple and it is after you arrive at the proper formula but you can only get there through a maze of complications, about three years, and several hundred thousand dollars.

By this time you are about to drag out the word "volume"—that familiar bugaboo of quantity production. You contend that there is no use designing an airplane that can be stamped out and put together like a Meccano ferris wheel unless you can get enough orders to make it possible to stamp out a lot of pieces thereby absorbing the tool cost. Since we had our romantic illusions many years ago when we introduced into production small cabin airplanes which form the basic design for most of the small ships sold today, our temerity has not led us to believe that the thinly spread domestic market will alone justify such a tooling setup. But it is a big world and we looked beyond our national borders and found a few surprises.

Previous experience indicated that crating, ocean freight, custom duties, and lack of service for an export customer gave small satisfaction to such a customer and the foreign dealer. Putting stamped parts for twenty airplanes in a crate no larger than necessary for one assembled airplane meant effecting the utmost customer economy and a mitigation of the crating expense, ocean freight, and the duty problem in foreign fields. Under our supervision our foreign friends can assemble airplanes as easily as we do it here. Foreign licensing is therefore the second of the three phases of our business. The licensees like it because they get a tried design, avoid engineering speculation and get these efforts for about ten per cent of what it would cost them to set up themselves from scratch, granting that the specialized knowledge was available.

Actually there is a difference between playing with a Meccano set and assembling our airplanes. And that brings us to the third phase of our business. One of our greatest problems is in training men, not only to put the airplanes together, but to teach them to participate in the ingenuity of tool design and production processes so that the airplanes will go together like a ready cut house or putting a fender on a modern automobile. We must not only build airplanes, but men.

Graduate aeronautical engineers were first invited for our training. They came from our best schools and universities—most of them were trained to be chief engineers and vice-presidents. They were extremely high in I. Q. but woefully low in practical application. After a year or so of careful supervision, skinned knuckles, studious research in metal processes, an educational system embracing engineering and shop practise was devised. We eventualy enjoyed a higher degree of per capital knowledge than is usually

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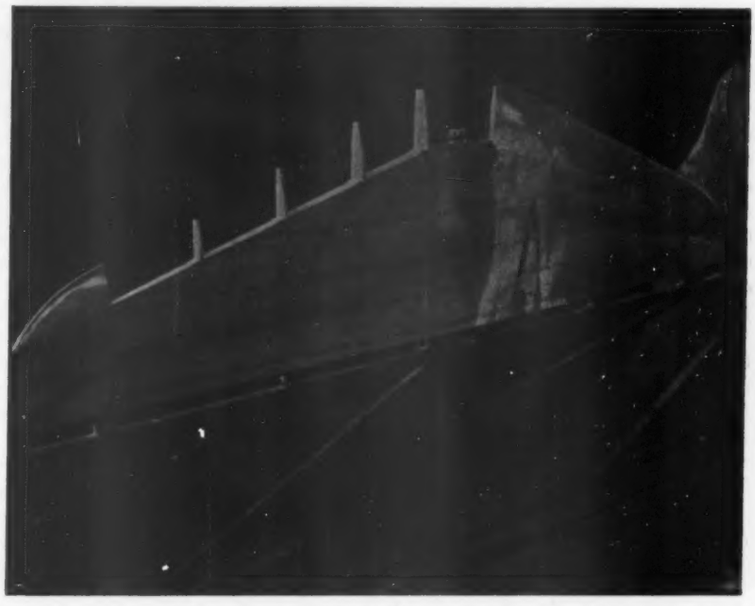

Templates for the stabilizer covering include rivet holes. Fixed surfaces are assembled from die stampings.

The Aluminum Company of America took the rap in turning out these extruded wing spars. They are exactly uniform and their use eliminates a wood shop in your plant.

"Down Under"

Australia, South Africa, and South America still offer untapped markets for U. S. aviation products. Some special conditions pertaining to the South American field are covered herewith. Studies of the other territories by other observers will follow.

MANY COMMERCIAL AIRCRAFT and equipment manufacturers have more than a mild interest in the development of foreign sales but in some instances have become discouraged because of the difficulties of carrying on their affairs in a foreign country without first hand knowledge of the sales problems (which are decidedly different than those they are accustomed to meeting in the United States).

There are at present five great potential markets for American commercial equipment. Two of them—Canada and Mexico—by their proximity and close association with our country, are practically "ready made." The other three, South America, South Africa and Australia, all below the equator, are worth definite attention. This article is pointed directly at the South American market because of the difference in people, customs, languages and business routine. Nevertheless, the others should not be ignored when considering the possibilities of foreign business.

One of the prime reasons for developing sales below the equator lies in the difference in seasons. When it is winter in the North, the birds are singing in the South, and vice versa. If, therefore, South American sales can be built up by planned effort, then the slow winter season in the United States will become something more than a long blue Monday.

A check of the export figures for the past ten years gives only a part of the picture because the breakdown between military and commercial export equipment is not evident. For example, Brazil has purchased approximately $6,000,000 worth of American aircraft and engines in the past ten years, 1927–1937, but practically all of this amount has gone for military equipment. Five years ago in Rio de Janeiro there were only three privately owned aircraft, a Fleet trainer, a wartime Moth and a small Savoia-Marchetti boat. There were no municipal airport, no fields that could possibly be called airports. Today there are six or more flying schools, one of the finest municipal airports in the world with other fields for private flying completed or under construction, and forty or more privately owned aircraft, the majority of them being of American manufacture.

The development in the past five years is primarily due to the world-wide interest in aviation. Particular development of commercial and sport flying in the Argentine and Brazil can be traced to a number of sources. The wealthy young Latin-American's enthusiasm for any hobby that will put him a notch above his companions, the prestige of owning and flying his own airplane and the opportunity to travel farther and faster in the pursuit of either business of pleasure. The governments are interested in giving amateur and commercial pilots every consideration as a means of training additional pilots without undue expense to the air services.

Many private schools are sprouting in the larger cities, some subsidized

Base of American export company in Buenos Aires (Company Sud Americana de Aviacion)

By H. T. Bylor

Left: Author on a charter demonstration flight in a Fairchild on floats. Below: Test hopping an American job in Rio after assembly

by state or government to the extent of funds for equipment and a bonus for every student trained. Fields are being designated and improved for the private flyer. Bureaus of Civil Aeronautics are becoming stronger and are planning elaborately for the future. Such things are bringing about South American aviation development much faster than the similar period we passed through in the United States, because of the availability of fine equipment and a great price range without need of technical development.

Builders of the class which could be used as feeder-line equipment and the class that point exclusively at this type of equipment are having a market made for them by the wide operations of Pan American Airways and other international services, in addition to the military and naval services in certain countries which operate their own air mail service to interiors.

Every large business using salesman, inspectors, service men, engineers, etc., are potential customers for aircraft. This is due to poor transportation to the interiors aside from the regular runs of international airlines.

Admittedly, past business in South America has been negligible for commercial aircraft manufacturers, but the serious development of sport and semi-commercial flying is beginning to be felt by the entire group. Most manufacturers are doing business either through a recognized aircraft export organization that sell both military and commercial equipment, or have appointed representatives that have qualified themselves by letters, or the purchase of an airplane as their guarantee. In both cases there is a possibility of not being represented properly. For example, the export company is primarily interested in military sales and unless it has an operating base in each republic, representation outside of the country in which it is located will be neglected. The individual representative, with a demonstrator, nine cases out of ten bought his equipment for personal use, and representation, though his efforts may be well meant, can only be through his immediate acquaintance or in the town or city in which he is located. It is impossible at present to be properly represented, in any of the four republics named, by either a single individual or an export company except in the limited area where they are based. The reasons are obvious if a map is consulted. For example, there are potential sales for some type of equipment in every fair sized coastal city between Rio de Janeiro and Buenos Aires. Without a demonstrator coverage of such an area would mean weeks of travel, and with a demonstrator, considerable expense that the individual or export company will not or cannot afford. The obvious solution is more assistance from the manufacturer and the effort, although it will require slightly more than moral support, will certainly be worthwhile for future sales.

The export company unless operating from a base in South America (only one in operation) is in the same

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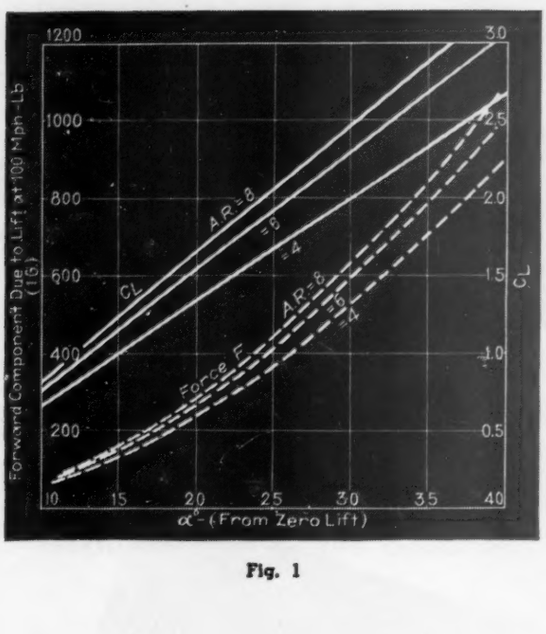

Fig. 1

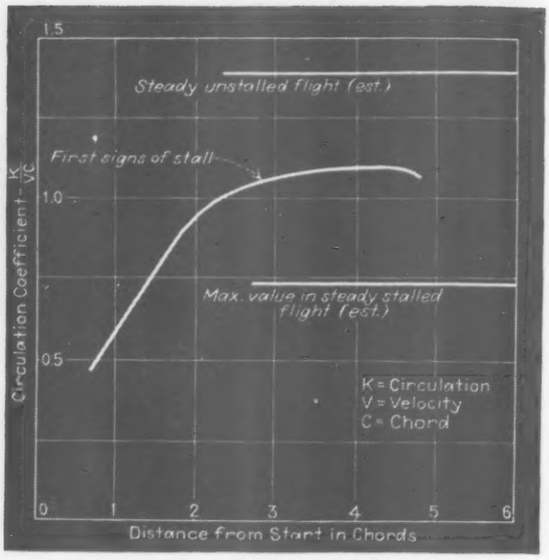

Fig. 2

Δt
—as an element in design

A rational approach to airplane design problems makes necessary a clean cut distinction between steadily applied and momentarily applied load conditions.

By T. C. Bennett

A BRIEF SURVEY of the evolutions demanded of an airplane, and for which adequate strength must be provided, shows that they fall roughly into two classes, those which the pilot controls and those beyond his control.

Most maneuvers, which include pull ups, pull outs, loops, turns and rolls, are of the first class and are (or may be) of continual application. The second group comprises loads of momentary duration which include mainly those due to inadvertent bumps, gusts or weather conditions over which the pilot has no control, and those due to landings or other impacts which the pilot may control to a limited extent.

This latter group, for aircraft of a purely commercial nature, assumes an increased importance since the maneuver loads may be limited by specification and regulation and can be kept within reasonable limits, whereas the uncontrolled loads will probably increase with the increase in aircraft speed. Loads beyond the control of the pilot then, necessarily, dictate the final design of the airplane.

One condition requiring investigation concerns the temporary development of lift coefficients greater than those indicated to be true under conditions of steady air flow. Such development of overlift is characterized by the absence of the usual burble which normally indicates that the lift is about to drop off.

When an airfoil is started suddenly from rest into steady motion, the fluid flow in its neighborhood passes through a series of different forms which approach asymptotically to the steady form which occurs in the wind tunnel and in the steady flight of airplanes.

During this transition period a vortex sheet, or surface, across which the velocity of the flow is discontinuous, is shed from the trailing edge of the airfoil and remains behind in the fluid, the strength of the discontinuity of the trailing edge falling asymptotically to zero as the steady state is approached. Wagner advanced the theory that, if the wake is infinitely thin and the trailing edge sharp, the form of the flow and the magnitude of the lift during this transition stage

could be calculated approximately on the assumption that the flow everywhere outside the wake is irrotational and that the strength of the discontinuity across the wake at the trailing edge has that unique value which is necessary to avoid infinite velocity at the edge. Later, Walker developed experimentally and photographed the two dimensional fields of the flow at various distances from the sudden start of an airfoil.

Measurements of the velocity fields near the airfoil gave a curve of circulation around the profile against distance from the start which was in remarkably close agreement with Wagner's theoretical curve. Later experiments indicated definitely that an airfoil which is started impulsively from rest at a high incidence may temporarily generate circulations and lifts larger than can be maintained when conditions are steady. This phenomenon is of considerable importance since it suggests that, if the wings of an airplane are moving with rapidly changing incidence, the lift may temporarily exceed the value based on the maximum lift coefficient of steady flight.

There is also some independent evidence of the occurrence of this overlift. Rhode integrated the pressure diagrams of an airplane moving with rapidly changing incidence and obtained lift coefficients exceeding the maximum in steady flight. D. Rolinson observed larger lift coefficients than in steady flight during the take off and landing of an airplane, although this experiment was complicated by the close presence of the ground which may possibly effect the maximum lift.

In the experiments described in R & M 1561, it was found that at a point 2.8 chord lengths from the start that the lift coefficient reach approximately 2.2 although the steady flight value from wind tunnel test was estimated to be 1.46 for the RAF 32 airfoil, thus indicating the temporary development of a lift coefficient approximately 50 per cent greater than normal.

The presence of this phenomon indicates the necessity of providing some design condition in order to insure adequate strength. It is evident that the increased value of the lift coefficient itself will exert no particular hardship on the airplane since the total lift on the wings is normally specified (or limited) by the design load factor.

IT SHOULD BE NOTED, however, that this condition occurred for the RAF 32 airfoil at 27.50 deg. above zero lift. In airfoils more commonly used in this country such as the Clark Y, etc., the maximum overlift probably occurs at later angles. The fact that the angles are large imposes on the wing structure very large forward components as can be seen by referring to Fig. 1. The forward component of the lift has not in this case been reduced by the necessarily increased drag but the inclusion of this quantity will not ordinarily alter the essential conditions. Roughly, at 30 deg. angle of attack (above zero lift) the forward-acting component is half the vertical lift which is much higher than would be normally provided for. This forward acting force will generally prove critical for the drag struts and wires in the panels of a biplane as well as stressing the front beams and part of the cabane structure. In a monoplane it is likely to prove critical for the upper flange of the front beam and the leading edge, and may under certain circumstances be critical for either the upper or lower surfaces of the wings.

As may be seen from Fig. 2, the maximum value of lift is attained at approximate 2.8 chord lengths from the start and exists, in the particular experiments under discussion, for approximately two more chord lengths. Assuming that this same number of chord lengths was required at full scale, the actual time interval from the point of change incidence would be approximately 0.2 seconds. Since for normal wing loadings and the best values of $C_{L\ max.}$ a speed of 100 m.p.h. is required to develop any great accelerations in a maneuver.

This matter of overlifts may be extended to include the loads developed due to the presence of a gust substantially normal to the flight path. There is evidence to indicate that, under the present assumption of a sharp edged gust, the values of lift may be developed which represents a

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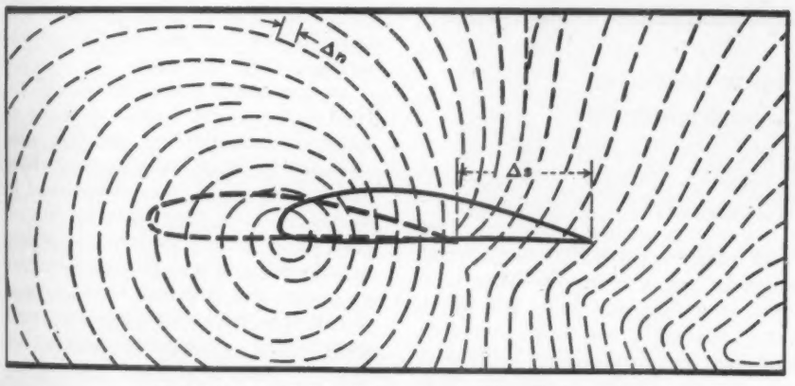


Transition in airflow when an airfoil starts from rest.

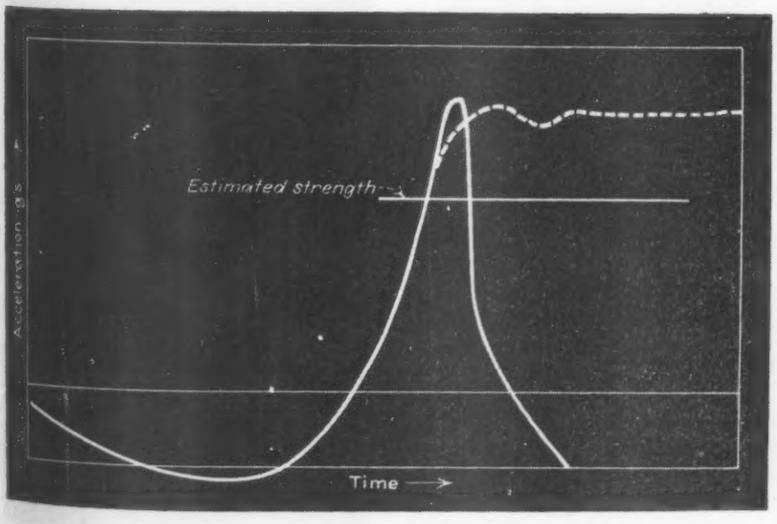
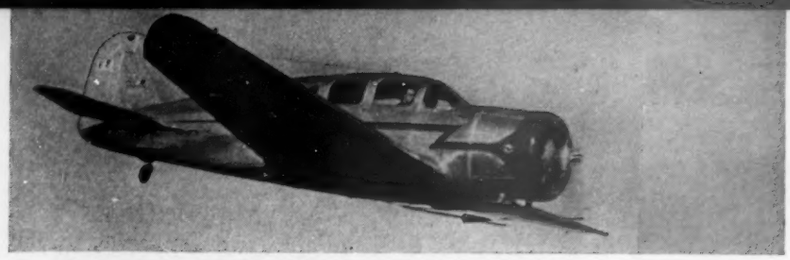


Fig. 3



SPARTAN
All Metal Executive

Personalized air transport features unique structure, high performance

THE NEW SPARTAN all metal executive is an airplane that speaks for itself. Without fanfare, twelve of these five place planes have been built, sold and delivered in the past few months and the production line of the Tulsa factory is rolling out three planes a month for delivery to waiting customers.

Carrying a useful load of 1413 lbs. and powered with the Pratt & Whitney 450 h.p. Wasp Jr., the Executive has a cruising speed of 205 m.p.h. at altitude, and a cruising range of 950 miles. Sea level cruising speed is 190 m.p.h. and landing speed 57 m.p.h. Equipment is at least as complete as on any private airplane of which we have knowledge, and cabin arrangement, soundproofing and upholstery should win the approval of the most exacting customer.

Cabin entrance is by means of a wide door on the left side of the fuselage. Front seats slide back a full 18 inches to provide easy access for pilots. A low step, wide non-skid walkway, and convenient built-in external hand grip all combine to make the ship as easy to enter and to leave as the average airline transport. Due to its unique construction the Spartan can make use of unusually large windows, as well as the wide, full length door. Vision is excellent, therefore, from any seat in the cabin. Exterior and interior finishes (Sherwin Williams) are according to Buyer's Choice. Complete Laidlaw upholsteries are used throughout, with deep cushions on all seats. Arm rests, ash trays, map compartment, interior or exterior openings to baggage compartment, heavy carpeting, cabin heaters and ventilators, double metal lining, Seapack soundproofing and numerous other refinements mark the Executive cabin.

An interesting and practical feature of the cabin arrangement is the convertible rear seat bench. This normally seats two people, providing unusually generous room for a total of four people in the cabin. But the plane is licensed to carry five and if the fifth person is to be carried a collapsible half seat in the center of the rear seat-bench is brought up into position, the center arm rest unfolds from its normal position to form a comfortable chair back, and the third rear seat passenger is accommodated with a clover-leaf seating plan.

Wings and tail surfaces are fully cantilever. Chief aerodynamic innovation is an unusual dual flap system, with vacuum operated independently controlled wing and belly flaps. This system permits the pilot to use either the belly flap alone, or all three flaps together.

Structurally the Executive deserves the closest examination for the stressed skin wings and fuselage are built around a rigid welded steel tube monospar system. This basic steel structure employs a single triangular wing spar and a single triangular fuselage boom. The central "backbone" is a rigid steel unit built up in a single jig and incorporating the center section spar and fuselage structure from tail wheel support to engine mount attachment. Thus all major loads of tailwheel, landing gear, engine, pay load, fuel load, and wing load are transmitted directly to a rigid steel truss structure around which the aluminum sheet shell of the fuselage and wings is assembled. The "backbone" carries 90 per cent of all structural loads, with only 10 per cent carried through the stressed skin structure.

In constructing the "backbone" the steel tube is welded on a large jig on which is mounted the complete wing spar and fuselage boom system. Each outer wing panel spar is attached by means of three taper pins to the corresponding center section spar fittings and the wing spars are then fabricated as though the structure were one unit. When the "backbone" has been completed and alignment checked, the

outer panel spars are detached and sent to the wing jigs for assembly to the wing proper, while the fuselage boom and center section spar portion goes to the fuselage jig for primary structure attachment and sheeting. It is of interest to note that not only are the wings and fuselage carefully jigged, but all component parts, such as the entrance door, engine mount, etc., are manufactured in accurate jigs for ease of assembly and complete interchangeability.

Wing ribs are built up of heavy dural sections, the cap strip being an accurately formed deep "U" section and the truss members dural open tubes riveted in place in a jig. These ribs are riveted directly to the steel monospar, after suitable anti-corrosive coating. The ribs are connected with spanwise stringers and the whole structure is then covered with smooth sheet 24 ST Alclad. While the wing covering provides purely supplementary drag strength, inasmuch as the steel monospar provides its own drag bracing, this covering does insure the torsional stiffness so desirable in a high speed cantilever wing. It is said that cases are on record where Spartan Executives have been dived at speeds exceeding 400 m.p.h without a trace of wing flutter or torsional flexure.

Assembly of the fuselage is similar to that of the wing, except that main fuselage bulkheads are bolted to the steel fuselage boom, other lighter bulkheads being riveted in place and the entire framework being covered with smooth 24 ST Alclad sections riveted in place. Power hammer forming of Alclad sheets is used to attain a smooth contour over the cabin and at the wing root fillets. Two main bulkheads carry cabin stresses down to the main spar structure for inverted flight stresses and nose-over protection. These bulkheads are built up from heavy flat dural formed into a riveted "I" beam. Each bulkhead has been tested to a load exceeding 7000 lbs.

All control surfaces are statically and dynamically balanced. Ailerons are mounted on ball bearings and other control surfaces in pillow blocks of generous size. All control surfaces are of aluminum alloy structure with fabric covering. Controllable tabs are provided on both elevator halves.

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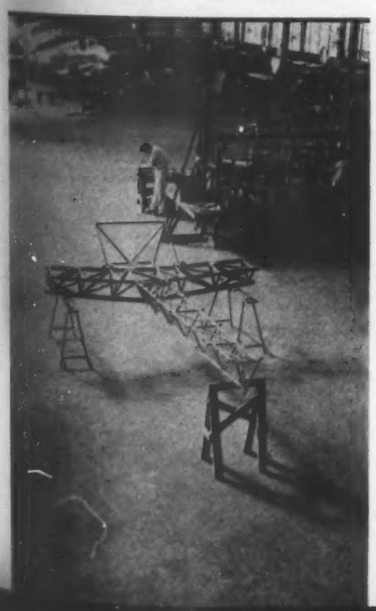
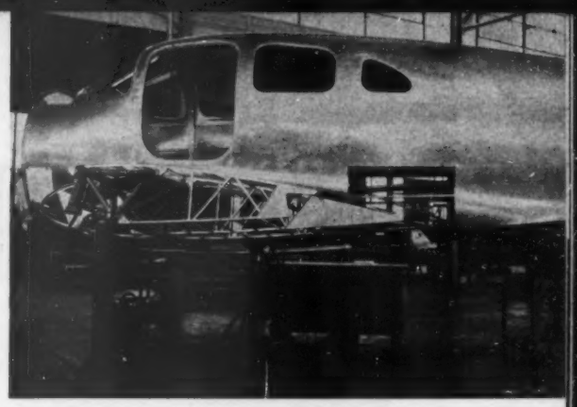
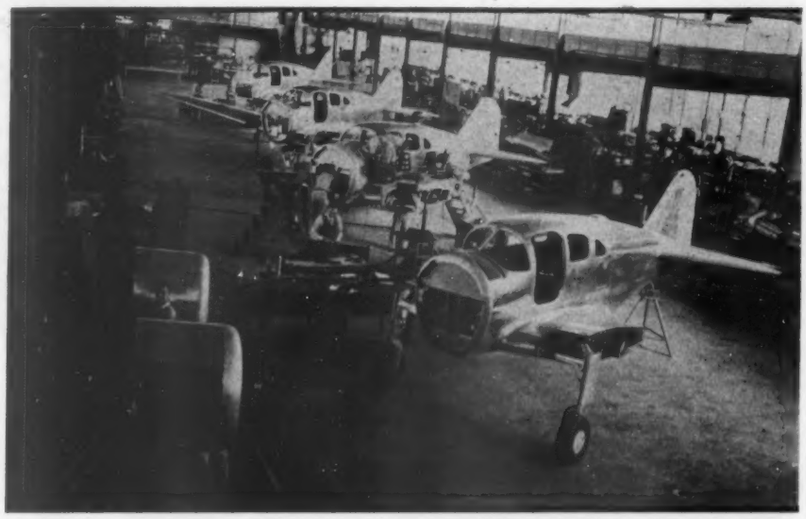
The Monospar "backbone

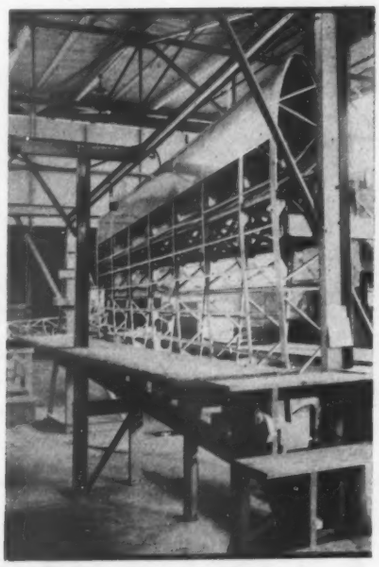




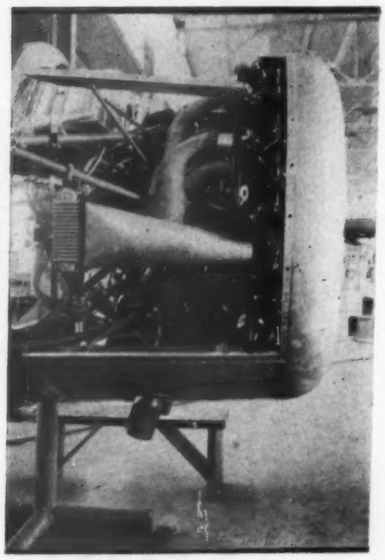
With the fuselage structure completed in the jig, the fuselage goes to the assembly line where additional operations, such as skinning the wing root, are performed.



Final assembly line in the Spartan factory. Note engine unit assembly jigs in foreground.



Monospar wings are assembled around the steel spar in a vertical jig.



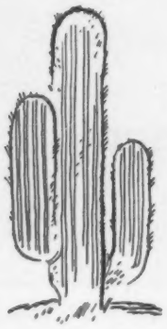
Engine units are assembled on jigs before installing.

IN BRANIFF'S

TEXACO AVIATION GASOLINE ★ NEW TEXACO AIRPLANE OIL FOR ENGINE CYLINDERS AND BEARINGS, SUPERCHARGER BEARINGS AND DRIVE GEARS ★ TEXACO OIL FOR MAGNETO AND STARTER BEARINGS ★ TEXACO MARFAK No. 2 FOR ROCKER-ARMS AND WHEEL BEARINGS

NEW TEXACO

NEW FLEET OF *DOUGLASES*



When their new fleet of Douglases went into service, Braniff made certain that their Wright Cyclone 1,000 h.p. Engines were lubricated with New Texaco Airplane Oil.

This is the airplane oil that is interesting the entire aviation industry. This is the oil that has come through tests so severe that engine builders and airline operators *found practically no wear at all.*

Not only did parts look like new, but piston rings fell free and there was practically no carbon present.

Trained aviation engineers will be glad to consult with you on the selection and application of New Texaco Airplane Oil and other Texaco Aviation Products, available at all important airports. Prompt deliveries assured through 2070 warehouse plants throughout the U. S. The Texas Company, 135 East 42nd Street, N. Y. C.

Braniff Airways' new fleet of Douglas Ships gives the flying public "friendly transportation —The Route of the Starlight Express from the Great Lakes to the Gulf." (Note modified Mexican uniform of Braniff hostess.)

TEXACO

Airplane OIL

AUTOMATIC Power Control

A British device to simplify the pilot's problem in handling supercharged engines under widely varying flight conditions

By John H. Millar

A.R.Ae. S.I.

EVERYONE KNOWS that if the pilot of a military airplane suddenly found an enemy aircraft diving on his tail, spraying bullets, he would bang his throttle wide open and forget entirely manifold pressure gauges, fuel-air ratio analyzers, mixture and supercharger controls and the hundred and one other gadgets that line his cockpit. For practically any other state of mind, however, it is only by the correct adjustment of each individual control that he can obtain optimum engine operation for any given conditions.

Primarily to meet military service requirements in England, the Hobson Master Control Scheme has been designed not only to relieve the pilot of all responsibility for his engine but to reduce in number and to simplify the cockpit controls. With this scheme a supercharged high-duty engine driving a constant speed propeller may be completely controlled by one lever only.

The invention of the automatic supercharger regulator was the first step. This device, which is sensitive to inlet manifold pressure, limits engine supercharge by regulating the opening of the throttle valve in the carburetor. With the original control, however, manifold pressure at low altitudes shot up suddenly with a relatively small movement of the pilot's throttle lever until it reached rated maximum pressure, after which it remained steady irrespective of further motion of the lever (Fig. 1).

Exact control of engine speed under certain cruising conditions was very difficult, particularly in formation flying. Also, which was more serious, it was possible to get full power on cruising mixture strengths because the power jet was timed off the opening of the carburetor throttle.

To eliminate this "lost motion" between the pilot's lever and the carburetor throttle, the Hobson Variable Datum Boost Control [N.B.—The term "boost" is the British equivalent of "supercharging"—Ed.] was introduced, and with this apparatus full manifold pressure at any altitude up to the rated height of the engine can only be obtained with the pilot's lever in the full open position, each partial movement of the pilot's lever changing the supercharge pressure in strict proportion to the angle through which the lever has been moved. In other words, the engine behaves as though it were unsupercharged.

The next obvious thing was to time the opening of the power jet by the pilot's lever instead of the carburetor throttle. This insures correct full power mixture strength at all altitudes and is the only known method by which the power jet timing can be traversed.

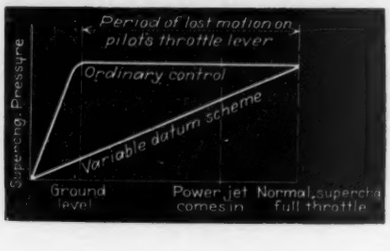
To the Variable Datum scheme has now been added the three phase control which provides individual adjustment for each of the three stages of supercharger pressures, corresponding to maximum "weak-mixture" cruising; "rated"; and "take-off."

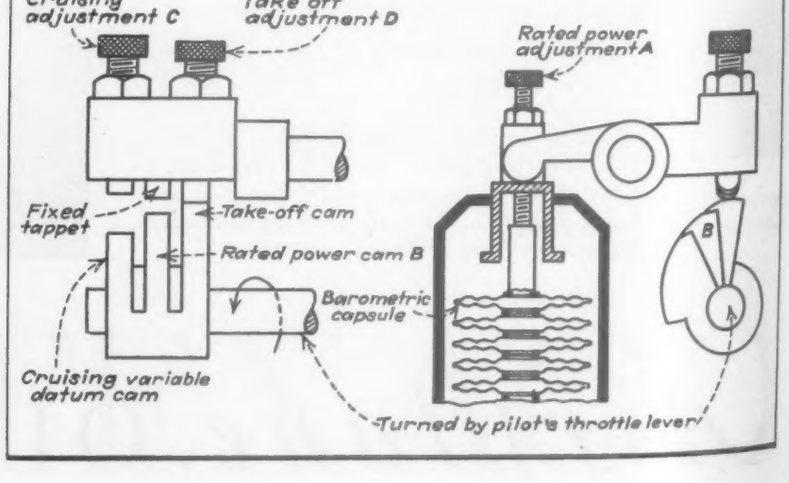
The actual operation is shown in

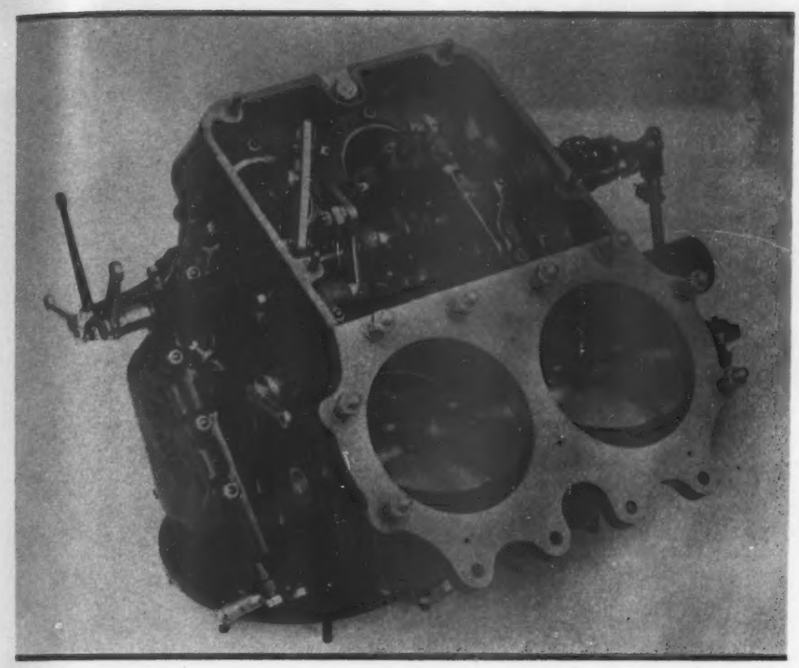
Flying Equipment

Diagram showing operation of the three-stage automatic supercharger control.

The diagram shows the difference in the shape of the manifold pressure curves for different positions of the pilot's throttle lever.







Master control carburetor with supercharge and mixture control integral. Note. Photograph is a twin bore 95 mm Hobson Master Control Carburetor (updraft type). It has 2-stage fully automatic mixture control; 3-stage variable datum control, slow running cut-out, magneto interconnecting levers for varying ignition timing, delayed action accelerating pump, provision for changing mixture ratio on engine with 2-speed superchargers, oil heated jacket to body.

Fig. 2. As will be seen, three cams are mounted on the pilot's throttle lever shaft which raise in turn the three tappets at one end of the pivoted rocker arm, the other end of which compresses the stack of barometric capsules in the control.

The contour of the cams is such that the manifold pressure is raised progressively with the angular movement of the pilot's lever, thereby giving the variable datum effect. A slight dwell is made on the peak of each cam which is at a radius with the centre of the throttle lever. These periods of dwell correspond to the three adjustable supercharge positions.

The supercharge control mechanism with its cams, rocker arm and adjustments, is completely housed within the body of the carburetor (Fig. 3). External linkages which previously existed between the control and the carburetor are thus eliminated, and apart from the resulting simplification and neatness, the possibility of the adjustments becoming disturbed is avoided.

As power output is closely related to mixture strengths it is essential that the correct fuel-air ratio be automatically ensured for different manifold pressures and maintained constant at any altitude up to the ceiling of the airplane and not merely to the rated height of the engine.

The three ranges of supercharge pressure are therefore each co-related automatically with three appropriate mixture strengths—"weak automatic" for cruising; "normal rich automatic" for rated power; and an "over-rich" mixture for take-off.

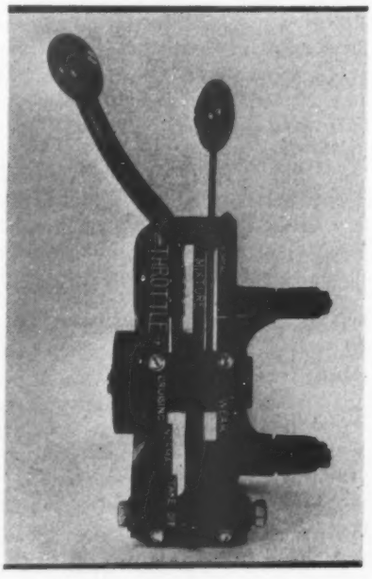
Built into the latest Hobson carburetor is the Hobson-Penn two-stage automatic mixture control. It has two distinct settings—one for maximum power and maneuverability known as "normal rich automatic" and the other for maximum economy known as "weak automatic." In either position, correction for altitude is automatic and is not under the control of the pilot. The manual control previously used by the pilot for adjusting mixture strengths according to altitude is replaced by a two position lever which permits selection of either "weak automatic" or "normal automatic" mixture for cruising.

Cockpit Controls

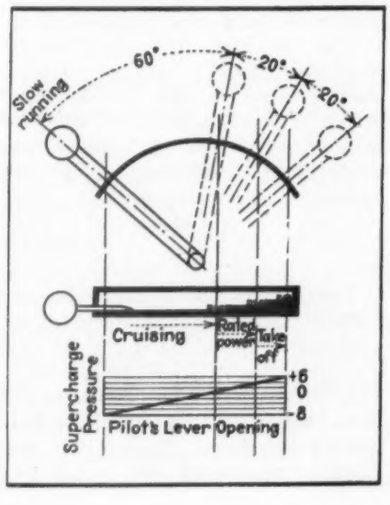
The throttle and mixture-selector levers are interlocked in the Hobson cockpit control unit. (Fig. 4).

The throttle lever has three ranges of movement over 100 degrees, and the mixture-selector lever can only remain in the "weak automatic" position while the throttle lever is in the cruising range, i.e., up to 60 deg. open. Opening the throttle a further 20 deg. forward to the rated supercharge position automatically moves the mixture control to "normal rich" and brings in the power jet. A further 20 deg. forward movement to full open position increases the manifold pressure to take-off pressure and automatically provides an increase in mixture strength by opening the enrichment valve.

(*Turn to page* 75)

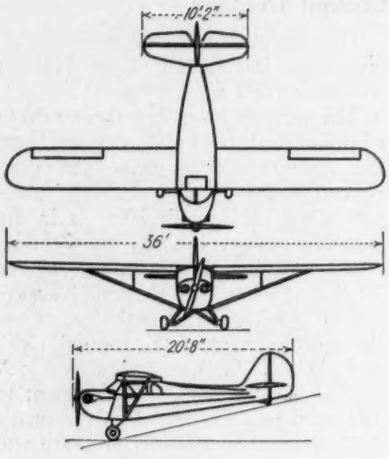


Three-phase supercharge control, pilot's lever movement and pressure curve.



Continental Aeronca

Latest Model Equipped with A-40 Series of Engines



CONTINENTAL POWERED AERONCAS of the KC model are beginning to appear at the airports. The new installation is very smooth in appearance, with the engine almost entirely cowled in. The clean lines of the nose of the ship carry smoothly back to the tail group. The large comfortable cabin is completely enclosed and weather-proofed against the elements. The "rakish" sloping windshield, the large amber-tinted overhead window and the smart streamlined rear windows insure a maximum of visibility. Ventilation is easily controlled by means of the large sliding windows that are raised and lowered in felt-lined channels. These sliding windows may be adjusted in any position to suit the occupants.

The side-by-side seat is wide and comfortable and may be removed and replaced by parachute if desired. The swing type seat is ideally adapted to this for the pilot's line of vision does not change when the seat is replaced by the parachute. The cabin is completely upholstered and finished in every detail. The new oval instrument panel is styled in a modern manner. Tachometer, oil temperature and pressure gauges are grouped in a single airplane type dial. The airspeed indicator, altimeter, gas shut-off and throttle are all conveniently located in the center of the wide instrument panel. The primer pump is furnished as standard equipment on this KC model. Two burnished aluminum control wheels are mounted in steel incased rubber bushings.

Friction in the control system has been reduced to a minimum by the use of Olite bearings in the ailerons and double ball bearings in the control column. Inspection of the control system in wings and fuselage has been made extremely easy by using transparent inspection windows. The ailerons are the very efficient frieze type. This insures effective lateral control and quicker response to the wheel. This ship has an elevator trimming tab conveniently located overhead that may be used to trim the ship while in flight. This is a very desirable feature as the ship may be flown "hands off" by the use of the tab.

Designed for long service the landing gear is of the tripod type with oleo shock strut in each side. The 70 inch tread is amply wide, the improved oleo action makes the ship taxi smoothly over the roughest field. Large Goodyear roller bearing airwheels add to the smooth taxiing qualities of this gear.

The tail skid is engineered to meet the requirements of the average flier who must somtimes land on rough fields and sometimes on surfaced runways. The shoe is made of chilled cast iron and is replaceable when necessary. All hinged parts of this gear are cushioned rubber. The piston type tail gear has rawhide bushings in the end to silence the recoil. The gear is singularly free from noise and vibration.

Over-strength streamline aluminum alloy vee struts brace the wings. Chrome-molybdenum tubing is used in all structural members in the fuselage.

Convenience and comfort of the pilot have been kept uppermost in mind in designing this new plane. There is ample luggage space provided directly behind the seat. The ten gallon aluminum gas tank insures a cruising range of 250 miles.

Specifications:

Wing span	36 ft. 0 in.
Length	20 ft. 8 in.
Height	6 ft. 7 in.
Empty weight	608 lb.
Useful load	452 lb.
Gas (10 gal.)	60 lb.
Oil (3 qt.)-(4 qt.)	8 lb.
Pilot	170 lb.
Passenger	170 lb.
Baggage	44 lb.
Gross weight	1060 lb.
Wing loading	7.94 lb. per sq. ft.
Power loading	25.6 lb. per hp.
High speed	88-93 m.p.h.
Cruising speed	80-85 m.p.h.
Landing speed	35 m.p.h.
Rate of climb	450 ft. 1st min.
Gliding angle	10 to 1
Service ceiling	12,000 ft.
Cruising range	250 mi.

4 Days to Buenos Aires

PAN-AMERICAN AIRWAYS SYSTEM
DOUGLAS DC-3 *High Altitude* AIRLINERS
powered by WRIGHT CYCLONES

Pan American Airways System will soon inaugurate faster schedules to Central and South America with a fleet of giant Douglas DC-3 high-altitude airliners powered by the latest type of Wright Cyclone engines.

These powerful Wright Cyclones, supercharged to fly at high altitudes over the snow-capped Sierras of Central America and towering Andes Mountains of South America—the loftiest mountain ranges of the Western Hemisphere—will reduce Pan American's flying time from the United States to Buenos Aires to four days—a saving of 24 hours under the old schedules.

Over routes which for centuries required endless months of surface travel, Pan American's luxurious airliners now speed from Continent to Continent in an incredibly few hours—overcoming amazing barriers of distance and linking North America with romantic and colorful Latin America.

Wright Cyclone-powered Douglas DC-3 airliners will be placed in operation on Pan American Airways' Western trunk route from Brownsville, Texas, to Cristobal, Panama, via Mexico and Central America—also on Pan American Grace Airways to Guayaquil, Ecuador; Lima, Peru; Santiago, Chile, and over the Andes Mountains to Buenos Aires, Argentina, and Montevideo, Uruguay.

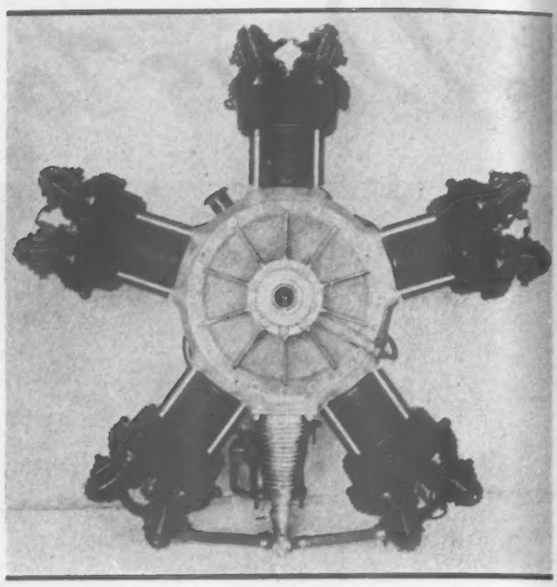
On the Eastern trunk route, Cyclone-powered Douglas DC-3s will connect with Pan American Clipper ships at Rio de Janeiro—saving 12 hours' travel to Buenos Aires.

Wright is proud of the part it has played in making possible the high-speed, dependable schedules of Pan American Airways System and other leading airlines throughout the world.

WRIGHT
AERONAUTICAL CORPORATION
PATERSON NEW JERSEY
A DIVISION OF CURTISS-WRIGHT CORPORATION

Security Engine

New 125-hp. radial passes A.T.C. tests



A FIVE CYLINDER RADIAL embodying many of the features found in engines of the highest price and power output has just received its A.T.C. and is to be manufactured by the Security Aircraft Corporation, Long Beach (Cal.) Municipal Airport. The Security S–5–125 develops 125 hp. at 1950 r.p.m. at sea level. Although it was designed primarily to power the "Airster" sport training plane, manufactured by the same company, the new engine will be available to other aircraft manufacturers. An unusual guarantee will go with each engine. It is an unconditional guarantee against cracked cylinder heads besides the regular warranty.

Frequent valve clearance adjustments are eliminated by the forced feed lubrication of the enclosed valve operating mechanism. In fact the manufacturer recommends adjustments only every 200 hours. In its official 50 hour Bureau full power and speed test, no adjustment was made and when checked the majority of the valves checked exactly as when put in. Rollers are provided on rocker arms at valve stems. This oiling system is quite different than other types in that it is circulating which aids in the cooling of the valves and cylinder heads.

The oil is forced into the hollow rocker arm axles, which are keyed to the rocker arms causing the axles to move with the arms. The oil enters under 100 lb. pressure and is forced out around the bearings saturating the valve stem and guide when it returns by gravity, from the three upper cylinders, to the crank case hence to the sump when the scavenger pump returns it to the oil tank. Surplus oil from the two bottom cylinder rocker boxes also drains, by gravity, into the sump and is returned to the tank along with the other. The oil pressure regulator is on the discharge side of the pump and is easily adjustable while the engine is running. Oil strainers are in the suction line of the main oil tank.

Motor mechanics and owners, throughout the country, who must pay the bills will readily recognize the value of this oiling system. Valve stems and guides should operate at least 1000 hours before regrinding or renewal respectively. Another advantage of this circulating type of oiling system is that the oil entering the rocker box absorbs considerable heat and carries it back down through the cooling sump where its temperature is reduced before it is returned to the tank. The fact that the valve stem and guide is thoroughly lubricated at all times eliminates friction and further reduces the heat in the cylinder head.

During our entire period of factory static, flight and Bureau testing the cylinder head temperatures rarely exceeded 400 deg. In the full power climb, with the air speed below 70 m.p.h., the head temperatures were well below 400 deg. averaging about 360 deg. The head temperatures on this engine could reach 500 deg. before causing any damage.

Another interesting feature is the new dual head automatic spark advance Scintilla battery ignition system. This is the latest type system produced by the Scintilla company after receiving an order from the Security Corporation. With this system starting is so little effort that mechanical starters are hardly necessary, but the manufacturer is working on the design of an electric starter which will be optional equipment in the near future. A twelve volt generator charges the storage battery, which supplies current for starter, dual ignition, cockpit and running lights. Any direct cranking type of starter can be mounted on crankshaft end without back gearing.

The motor has a three lobe cam ring running at 1/6 engine speed in the same direction as the crankshaft. This arrangement reduces the cam ring bearing speed as the extension of the main timing pinion is the journal for this bearing.

The three piece cast aluminum alloy crankcase carries two anti-friction and one sleeve type crankshaft bearings. Front section houses large thrust bearing and is externally ribbed for cooling. Cast aluminum accessory drive case houses a three lobe cam ring operating at one-sixth engine speed, and the drives for ignition distributors, tachometer, oil pumps and generator.

The crankshaft has B bearings. The ball thrust bearing is between the propeller and the front main, making it possible to use the engine in a pusher as well as a tractor aircraft. The front main is a sleeve bearing and is provided for the entrance of the oil into the crankshaft. It is a babbitt lined steel backed bearing of generous proportions. The rear main is a roller bearing of ample load factor which should render it unnecessary to renew during the life of the engine.

Cylinder barrels are nickel iron machined all over, resulting in uniform wall thickness and fin lengths. Fins are spaced 3/16 in. apart, spaces are $\frac{1}{8}$ in. and fins are 1/16 in. thick. The barrels extend $1\frac{1}{4}$ in. into the aluminum alloy heads which are shrunk on by pre-heating.

Following is complete list of characteristics:

Type	static radial
Cycle	four
No. Cylinders	five
Bore	4.75 in.
Stroke	5.00
Displacement	44.5 cu.in.
Compression	5.1 to 1
Rated r.p.m.	1975
Rated power	125 hp.
Maximum power	139.5 hp.
Fuel octane	74
Weight	325 lb.

FSQUIRE • BUSINESS WEEK • TIME

TIME, October 18, 1937

IT'S SMART To "Go Douglas"

Passage aboard a Douglas Airliner is an interlude of delightful social contacts. Cultured women prize Douglas luxury ... it's the fastidious way to travel. Next time business or pleasure takes you away from home, be smart ... make reservations on any major airline and "go Douglas"

DOUGLAS AIRCRAFT CO., INC.
SANTA MONICA, CALIFORNIA

AMERICA: AMERICAN AIRLINES INC..EASTERN AIR LINES..TWA..UNITED AIR LINES..CANADIAN AIRWAYS..BRANIFF AIRWAYS..WESTERN AIR EXPRESS..WILMINGTON-CATALINA AIRLINES • SOUTH AMERICA: Pan American Grace Airways • AUSTRALIA: Australian National Airways • EUROPE: OELAC, Austria . . Deutsche Lufthansa, Germany . . K.L.M., Netherlands . . L.A.T., Linee Italiane, Italy . . LOT, Poland . . C.L.S., Czechoslovakia . . Swissair, Switzerland . . A.B. Aerotransport . . K.N.I.L.M. in Netherlands East Indies • ORIENT: Japan Air Transport . . China National Aviation Corporation . . K.N.I.L.M. in N...

"GO DOUGLAS" WHEREVER YOU TRAV...

SP...

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MEMO

This Douglas advertisement in TIME, Oct. 18, 1937 is typical of the consistent promotional campaign in behalf of airlines using Douglas equipment.

Supporting the industry, Douglas advertising in Time, Esquire and Business Week is selling and re-selling air travel to a reading audience of over 4,000,000.

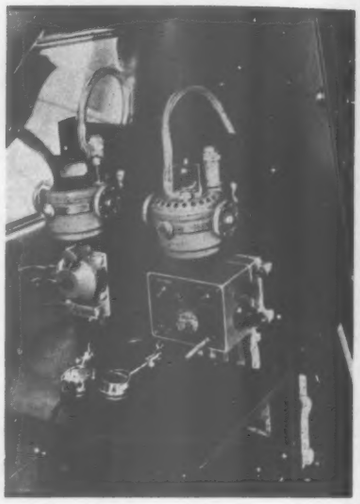
Aircraft Radio

New Equipment for Communication and Navigation by Henney and Fink

New R.C. 5 Radio Compass Demonstrated at Newark

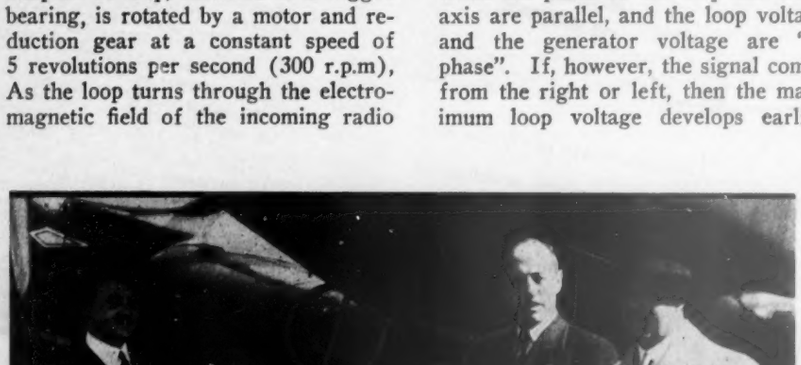
TECHNICAL EDITORS of radio and aviation journals were given an opportunity to witness the R.C. 5 direct-reading radio compass in action, on October first, when a demonstration was held by officials of the International Telephone and Telegraph Company and their subsidiary, Le Materiel Telephonique, of France. The R.C. 5 compass was first described more than a year ago by its inventor, H. Busignies, of the L.M.T. Laboratories, but no opportunity of seeing it operate was offered in this country until the recent demonstration. Cooperating with the I. T. and T. were the American Airlines, in whose trimotored Stinson the equipment was mounted.

The principle of the compass is simple. A loop, mounted in a rugged bearing, is rotated by a motor and reduction gear at a constant speed of 5 revolutions per second (300 r.p.m), As the loop turns through the electromagnetic field of the incoming radio wave, a voltage is induced in the loop which varies from maximum to minimum twice in each revolution, that is, an alternating current of 10 cycles per second frequency is generated. On the shaft which drives the loop is mounted an alternating current generator. This generator produces, likewise, an alternating current of 10 cycles frequency, but without reference to the incoming wave. The loop and the armature of the generator are so positioned with respect to each other, on the drive shaft, that the locally generated voltage becomes maximum when the loop is parallel to the axis of the ship. If the incoming wave comes from *directly ahead*, or *directly behind* the voltage generated in the loop is also maximum when the plane of the loop and ship-axis are parallel, and the loop voltage and the generator voltage are "in phase". If, however, the signal comes from the right or left, then the maximum loop voltage develops earlier or later than the maximum generator voltage; i.e., the voltages are out of phase, by a number of degrees equal to the bearing of the signal with respect to the axis of the ship. To measure this bearing it is necessary simply to measure the electrical phase difference between the loop voltage and the locally generated voltage, which is done in a new type of phasemeter. The phasemeter resembles an induction motor, the armature of which is the bearing indicator. The loop and generator voltages are fed, separately, to two coils in the phasemeter, and their combined magnetic effect causes the armature (to which the indicating card is attached) to take a position corresponding to the angular separation between the signal direction and the ship's axis.



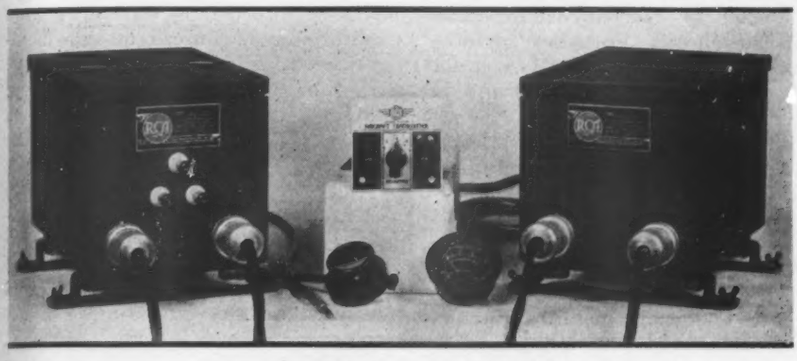
The R. C. 5 Indicators

In the demonstration, the plane was flown in several wide turns, with the receiver tuned to the broadcast station WOR, at Carteret. The radio-compass indicator showed the change in direction, in degrees in exactly the same manner as did the magnetic and gyro compasses, except that the reference was WOR rather than "north." The plane was then flown at an angle to the WOR signal, and the method of resolving the 180° ambiguity (by flying to the right or left and noting



At the Newark demonstration: L. C. Gallant, L.M.T. engineer, the rotating loop. George Lewis, I. T. and T. official, and the inventor, H. Busignies

the increase or decrease in the bearing) was shown. Next WOR was used as a homing station, the pilot following the wave dead ahead. During this homing flight, L. C. Gallant, engineer of L.M.T., took cross bearings on the beacons at Martin's Creek and Elizabeth, and performed a triangulation to establish the plane's position (near New Brunswick) at the time the cross bearings were taken The speed with which these cross-bearings were made (since no manipulation but that of the tuning control was necessary) was very impressive, resulting in a high degree of accuracy in the plotted position. When the plane passed WOR, the indicator swung rapidly from left to right, indicating the passage of the plane over the towers. Equipment weighs 50 lb., draws 10 amp. from 12 volt supply.



New RCA transmitter AVT-7B

From Camden: New RCA Transmitter and Receiver

Over at the Camden Airport, we saw Dave Little and had a convincing demonstration of two brand-new models, the AVR-7G Receiver and the AVT-7B Transmitter. The transmitter represents a redesign of the older models AVT-7 and AVT-7A, planned to take full advantage of the new flying aids now aborning under the direction of the Bureau of Air Commerce. Extended watch hours to be maintained on remotely controlled receivers, on both 6210 kc. and 3105 kc., for itinerant craft transmissions, make transmitters much more worthwhile for the private flyer than they have been heretofore. The AVT-7B is therefore designed for four frequencies, two day-time and two night-time, using two crystal units for the lower frequencies and "doubling" to the higher ones. These are the standard frequencies 3105, 3120, 6210, and 6240 kc. Other pairs frequenc' may be used, if crystal frequenc.. are kept within 2 per cent of each other, anywhere in the range from 2600 to 6500 kc.

Power is 20 watts, 100 per cent modulated on phone, with CW transmission available if desired. A new microphone which operates only for "close-talking" (within one-half inch), greatly decreases motor roar and background noise. Provision is made for interphone connection, highly useful in multi-place ships for "inside" communication. A meter for indicating antenna current (r-f amperes) is provided, an unusual feature in transmitters of this power but highly useful in determining proper operation. Complete remote control is obtained from the 3¼" by 3¼" control panel. The power unit (vibrator type supply) and transmitter unit are mounted in two similar cases. The total weight, (power unit, transmitter, control unit, meter, cables, microphone) is 35 pounds. The list price is $395.00.

The new receiver replaces the older AVR-7B and AVR-7C. Actually four varieties of the new model are available: 7D is the receiver alone; 7E, receiver and two crystal units for crystal control on any two high frequencies in the aircraft spectrum; 7F, receiver with beat frequency oscillator for CW reception; and 7G, receiver with crystal units and beat oscillator. The prices go from $195.00 to $337.00. In addition to improved sensitivity, selectivity and signal-to-noise ratio the new receiver adds a new frequency range, 490 to 1400 kc., containing the broadcast band and the International calling and distress frequency, 500 kc. The other bands are standard, 195 to 420 kv. beacon and weather, and 2300–6700 day and night communication channels.

The crystal control feature, available in models 7E and 7G, vastly simplifies the problem of tuning to fixed frequencies in the high frequency bands. With the crystals in place, the band may be tuned from one end to the other, with no reception except at the predetermined crystal frequencies. At the crystal frequency the tuning "locks in", giving full reception without critical adjustment of the control knob.

New Trailing Antenna Equipment

Aeronautical Radio Company of Roosevelt Field has announced a new trailing-wire antenna reel, made of low-loss XXX Bakelite, capable of accommodating 250 feet of 1/16" 7x6 phosphor-bronze wire. The antenna wire, after attachment to the reel is cut to the proper length to load the transmitter. Both direct hand-crank and remote-control crank models are available. The reel itself weighs 14 ounces. The remote control, manually operated, includes 15 feet of flexible shafting, gear box and reel, total weight 5 pounds. The remote control crank is fitted with a latch which stops the reel within ¼ turn if it is released inadvertantly. The gear box is fitted with a friction clutch to protect the gears and shafting if the plane is landed with antenna reeled out. Also available is a lead-in fixture, with turned-brass, cadmium-plated mouth which receives the streamlined antenna weight. A miniature "wind-sock" may be used in place of the weight to provide positive drag, and to insure prompt reel-out of the wire.

Trailing wire equipment

Buyers' Log Book

What's New in Accessories, Materials, Supplies, and Equipment

Weems Watch—

Second-Setting Instrument Designed in collaboration with Longines

NEARLY TEN YEARS AGO Commander P. V. H. Weems, who is well known to readers of AVIATION, developed a second-setting watch which has been widely used for air navigation and included in the equipment of many famous flights. Later a watch of this type for general use as well as for navigation was developed by the Weems System of Navigation in collaboration with Longines-Wittnauer Company, Inc.

The second setting feature consists of a large central seconds hand and a movable bezel on which the second graduations are marked. In operation the bezel rather than the seconds hand is moved for setting.

A standard and a wrist model are available. The standard model varies less than two to four seconds per day and the wrist model less than three to six seconds.

A number of other types of watches and clocks for aeronautical use are included in the Longines Line.—AVIATION, *November, 1937.*

Second-setting Watch

No-Loss Cable—

For radio and other aircraft applications

A NEW NO-LOSS CO-X cable which is particularly useful for radio applications in aeroplanes, has been introduced by the Transducer Corporation, New York, N. Y. The company reports the sale of eighteen miles of this cable by one of its European associates to a European airforce which has adopted it as standard, not only as antenna lead-ins but also in the radio construction.

Wherever sheathed concentric cable was previously used or where is could not be used because of weight, inflexibility, or cost, the use of CO-X is recommended.

Uses of CO-X are in antenna lead-ins, transmission lines between photo electric cells and amplifiers; in circuits where H.F. or leakage losses must be a minimum, and in similar circuits where radiation or pick up must be a minimum and low leakage is essential.

CO-X is comprised of three components, (1) the braided inner copper conductor, (2) the ANHYGRON separators; and (3) the outer conductor braid. In the past a lead sheath has been necessary to prevent moisture from attacking the insulating material. ANHYGRON is absolutely non-hygroscopic, and needs, therefore, no such protection from moisture. Beside this very important feature it has the other characteristics required in a perfect dielectric: very light weight, high strength, infinite resistance, exceedingly high breakdown voltage (1,250,000 volts per inch) and a dielectric constant of 2.5—AVIATION, *November, 1937.*

Tachometer—

By Kollsman is sensitive through range of 3500 r.p.m.

THE LATEST Kollsman electric tachometers, types 278-01, 301R-01 and 277-01 add a number of distinctive features to the already well recognized advantages of the remote indicating tachometer for many installations. Among the chief claims for these instruments is the high degree of accuracy which is said to be within 10 r.p.m. throughout the working range. Types 278-01 and 301R-01 are of sensitive two pointer design with a range of 3500 r.p.m., the large pointer indicating 1000 r.p.m. for each complete revolution. The instruments are similar except that the type 301R-01 incorporates warning sectors conforming to Bureau of Air Commerce regulations. The type 277-01 indicator has a single pointer and covers a range of 0-2000-3500 r.p.m. by providing for 1¾ revolutions of the pointer.

All these types employ the same generator unit, and all units are completely interchangeable. Standard diameter is 3⅛ in. and weight of indicator 19 oz., generator 35 oz. General features of all instruments are accuracy guaranteed to within 10 r.p.m., permanent calibration, extremely close temperature compensation, no brushes or moving contacts, no radio interference, calibration independent of length of connecting wires, two indicators may be operated from one generator, generators may be operated in either direction, drive through precision bearings with life time sealed-in lubrication, luminous pointers and dial. AVIATION, *November, 1937.*

Kollsman Electric Tachometer Type 278-01.

Non-Corrosive Oil—

for batteries developed by NoKoroso Company

AN INTERESTING NEW COMPOUND of interest to everyone who uses or services storage batteries is the compound NoKoroso manufactured only by the NoKoroso Company, Plainfield, N. J.

Sold in tube form, NoKoroso is an oil for which it is claimed that battery terminal corrosion is completely eliminated so long as the NoKoroso remains on the terminal. It is claimed to make a better electrical contact, to dissolve corrosion already existing, to be non-inflammable, non-explosive, non-poisonous, harmless to the hands, and contains no soda or ammonia.—AVIATION, *November, 1937.*

Homelite—Black & Decker portable power driven tool equipment in use

Portable Power—

Motor-generator set for jobs remote from power lines

LACK OF CENTRAL STATION POWER SUPPLY is no handicap to the shop which uses the new combination of a portable power unit offered by the Homelite Corp., Port Chester, N. Y., and Black & Decker Mfg. Co., Towson, Maryland. Black & Decker has designed its tools and motors for operation from either AC or DC current, making it possible to readily employ the Homelite power source when in remote spots. This is of special interest to aircraft operators who may in emergency be required to make repairs far from electric power supply.—AVIATION, *November, 1937.*

Fafnir Cartridge—

Changes plain bearing motors to ball bearing type

OFFERED as a replacement unit for plain bearing electric motors, a new cartridge type ball bearing by the Fafnir Bearing Company, New Britain, Conn., may be used to convert a plain bearing electric motor into a ball bearing motor. To effect the conversion the end-bell is bored out and the Fafnir cartridge is bolted or welded into place. The Fafnir Ball Bearing Motor Cartridge is supplied in 43 sizes, for shaft diameters from 13/16 in. to 3½ in.—AVIATION, *November, 1937.*

Handy Screwdriver—

Grip-point handles small parts

A LITTLE TOOL that will save many an engine mechanic's temper and otherwise clear the air around maintenance shops is the handy little grip-point screwdriver offered by the Stromberg Motoscope Corp., 2701 Belmont Ave., Chicago, Ill. Made in blade widths of $\frac{3}{16}$ in., $\frac{1}{4}$ in., and $\frac{5}{16}$ in. the Stromberg grip-point screwdriver is non-magnetic and may be operated with only one hand. Through a locking grip-point in the screwdriver blade, controlled by a grip release near the handle, this screwdriver both holds and drives the screw.—AVIATION, *November, 1937.*

New Lock Nut—

Another device to lick vibration problems in construction

HOW ANY NUT can break loose these days (unless from a poorly guarded "booby hatch") is difficult to understand when one considers the thought and engineering effort that has been concentrated on the development of foolproof self locking nuts. A new self locking nut has appeared on the market incorporating an entirely new principle. Known as the "Unshake" and manufactured by the Standard Pressed Steel Co., Jenkintown, Pa., the new nut incorporates on integral self locking ring working somewhat on the principle of a wrap-around brake band. Although the nut can be backed off with an ordinary wrench it is reported that no vibration will cause it to loosen. In practise the "Unshako" nut can be used over and over again, and it is easily removed by hand after loosening by one or two turns with a wrench.—AVIATION, *November, 1937.*

High Speed Shear—

for work on irregular shapes in 12 gage stainless steels or alloys

CONSTRUCTED PRIMARILY TO HANDLE IRREGULAR SHAPES IN 12 GAGE STAINLESS STEELS OR ALLOYS, a new type shear is offered by the Libert Machine Company, Green Bay, Wisconsin. Designated Model 1060, the shear has a throat depth of 60 in. instead of the usual 36 in. In order to handle the unusual stresses imposed the frame is made of steel fabricated and welded. It has hand control to permit inside cutting without starting holes, and incorporates features of previous Libert shears. Material is sheared rather than punched. It will not feed itself by the action of the cutters. A high degree of accuracy is maintained and there is no need of further finishing of sheared work.—AVIATION, *November, 1937.*

Wheel Cement—

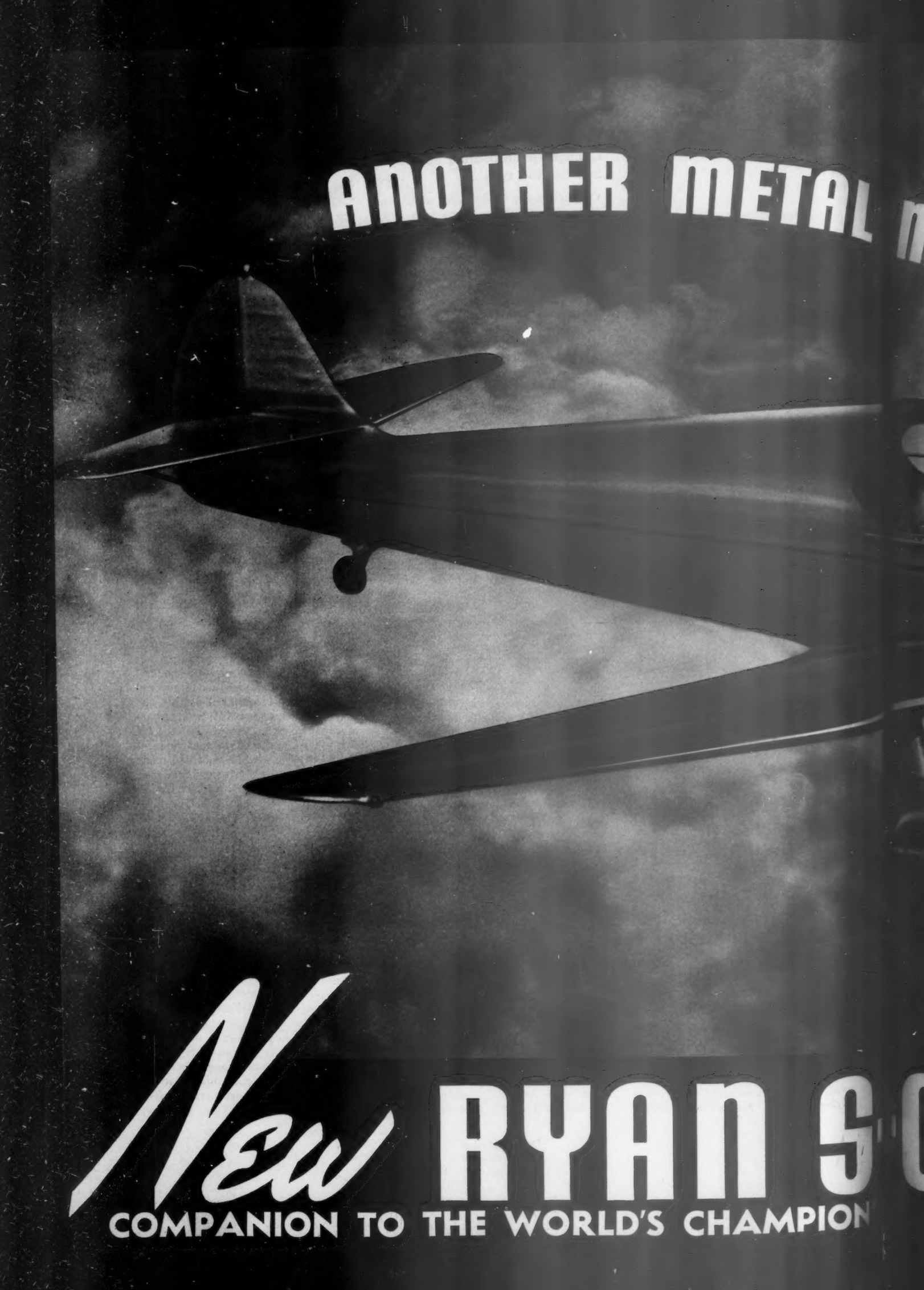
offered by Midwest Abrasive; Samples are available.

DEVELOPMENT OF A NEW CEMENT FOR POLISHING WHEELS, permitting exact regulation for wheels of canvas, leather, felt, sheepskin, wood covered with leather, compressed leather, or felt, is announced by Midwest Abrasive Company, Detroit, Mich. By the use of a special thinner and required density of cement can be made up so that wheels of varying densities can be uniformly surfaced. Interested users are offered free samples.—AVIATION, *November, 1937.*

Die Sinker—

A handy gadget for any shop

A MACHINE that practically thinks for the machinist has been perfected by Frank W. Hack, 440 North Oakley Blvd., Chicago. Of greatest application in die manufacture, it is useful wherever many operations must be performed on a single piece of work. Occupying floor space four feet square, the machine is equipped to operate as a milling machine, shaper, drill press, or hack saw. It performs fifteen different kinds of cutting operations with regular equipment and more through auxiliary adapters.—AVIATION, *November, 1937.*


ANOTHER METAL
New RYAN S
COMPANION TO THE WORLD'S CHAMPION

Product of 15 years' devotion to perfecting airplanes, progeny of the "Spirit of St. Louis" and companion to a world's champion* no airplane claims so fine a heritage as the new Ryan S-C. A modern 3-place "convertible coupe" type of ship with ample luggage space, the S-C commands attention in any company for its sleek beauty, extreme maneuverability and high performance. Unlike most cabin jobs, vision over the nose, to the sides and overhead is unobstructed. The S-C is powered by a Menasco 150 supercharged engine. Another masterpiece by a pioneer builder of metal sport planes, now in production; Deliveries in rotation.

RYAN AERONAUTICAL COMPANY
LINDBERG FIELD, SAN DIEGO, CALIFORNIA

*In his stock Ryan S-T against a field of stunt specials, Tex Rankin won the 1937 International Aerobatic Championship at St. Louis last May.

Operators' Corner

An exchange of ideas on the problems of the commercial aviation industry

QUESTION 26: The Air Commerce Bureau has been considering the possibility of licensing the managers of large airports. What do you think of the idea? To what class of airports should it apply? Is there any standard of qualifications desirable for an airport manager? If so what should the minimum requirement be? Do you think it would be possible to set standards for such a position?

Unnecessary at Large Ports

I MUST RESERVE MY OPINION of the proposed licensing of airport managers by the Bureau of Air Commerce until I know just why they consider a license necessary, what the requirements for such a license would be, the regulations under which such a license would be issued and the requirements for keeping such a license.

In my experience, the metropolitan airport of today has come a long way from the barnstorming air circus days of ten years ago. Pittsburgh for instance has become an airline terminal and very little other activity is present. Transient commercial and private flying is not extensive and what there is is not an operating difficulty.

Without studying the question closely I would say there is no need of an airport manager's license at such airports as Pittsburgh, Chicago, Cleveland, Newark or any of the other large airline stations, as the manager at these airports is more or less of a coordinating agent between the operation of the airport and its maintenance. Our tower, for instance, is manned by qualified operators and we have two men in training for tower duty in addition to the six regular operators. We are thereby following the proposed regulations for control tower operators. The airport management is not engaged in any flying activity of any sort and therefore no regulation on that point is necessary.

However, at airports where the management is in the flying business or in direct control of flying activity, that is, secures revenue from flying, there is a definite need of some regulation to protect the public.—JOHN J. MCLEAN, *Director of Aviation, Pittsburgh, Pa.*

QUESTION 27: What has been your experience in selling airplanes to prospects who carry substantial life insurance? Have you found the ratings put on private pilots productive of sales resistance? What methods have you used to overcome the difficulties resulting from this condition?

Three Sales Lost

I KNOW OF THREE MEN in this area, all financially able to pay cash for instruction and an airplane, if the insurance factor had not been a deterrant.—W. D. CRETE, *Director, Plattsburg Municipal Airport, Plattsburg, N. Y.*

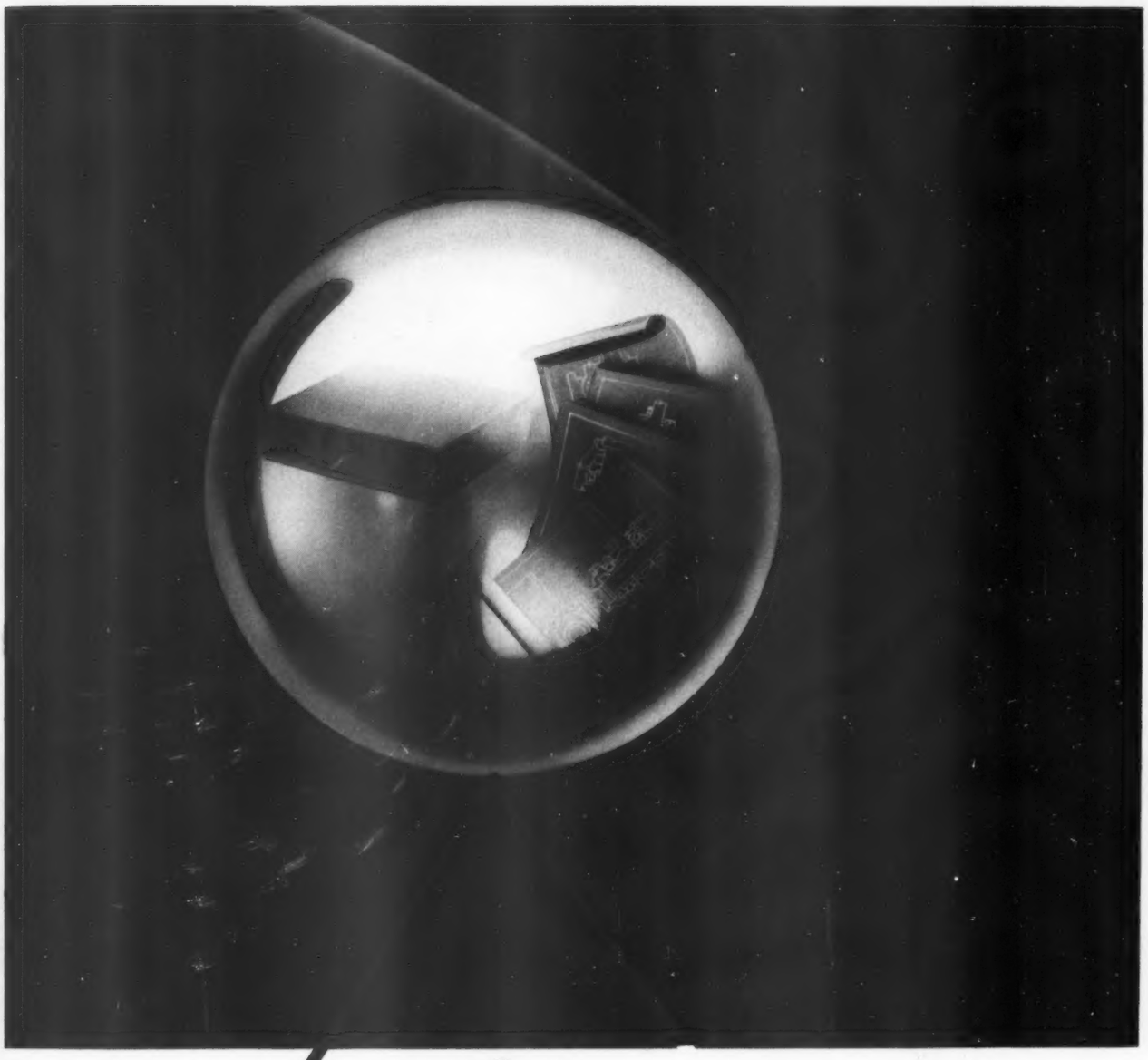
An Error

IN THE OCTOBER "Operators' Corner" it was stated in a reply entitled "Should be Licensed" that Mr. A. J. Hartman was manager of the Burlington, Vt. Municipal Airport. The manager of this airport is Mr. Harold W. Pugh. In calling our attention to the error Mr. Pugh informs us that he has held his present position for the past six years.

Next Month's Question

QUESTION 28: What specific methods have you used to promote your business? What forms of advertising have you used and to whom has it been directed? Have you made use of contests, premiums, exhibitions and with what success? What original methods have you developed for this purpose?

Cub Distributor Al Bennett never misses a chance to display his wares. In exhibits like the one above (New Jersey State Fair) students get actual selling experience. The student seated is announcing over the public address system; the student standing is distributing literature. Mrs. Bennett is showing the familiar cub pins which are on sale.



Balance in Production

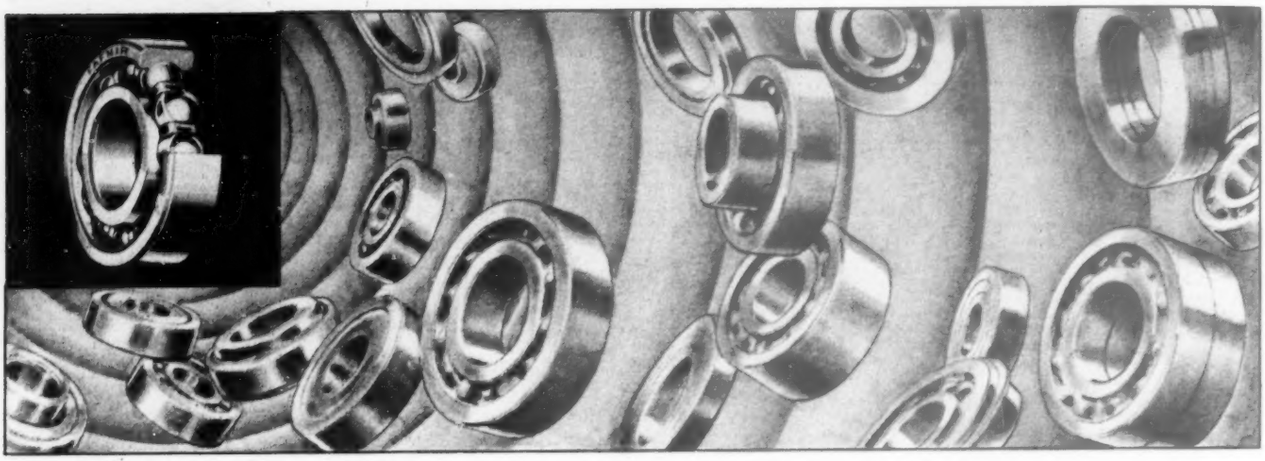
The balance of Fafnir production between standard and specialized ball bearings results in important advantages. Because so wide a range of types and sizes are standard items in the Fafnir line, engineering and production of specialized bearings can be limited to those where a definite departure from stock material is absolutely necessary.

Yet, when required, these specialized bearings are more efficiently produced because of Fafnir's extensive experience with *all* types. That is why Fafnir engineering and production staffs are better able to handle all customers' demands for specialized applications. And that is how Fafnir brings down costs and speeds up service on specialized bearings.

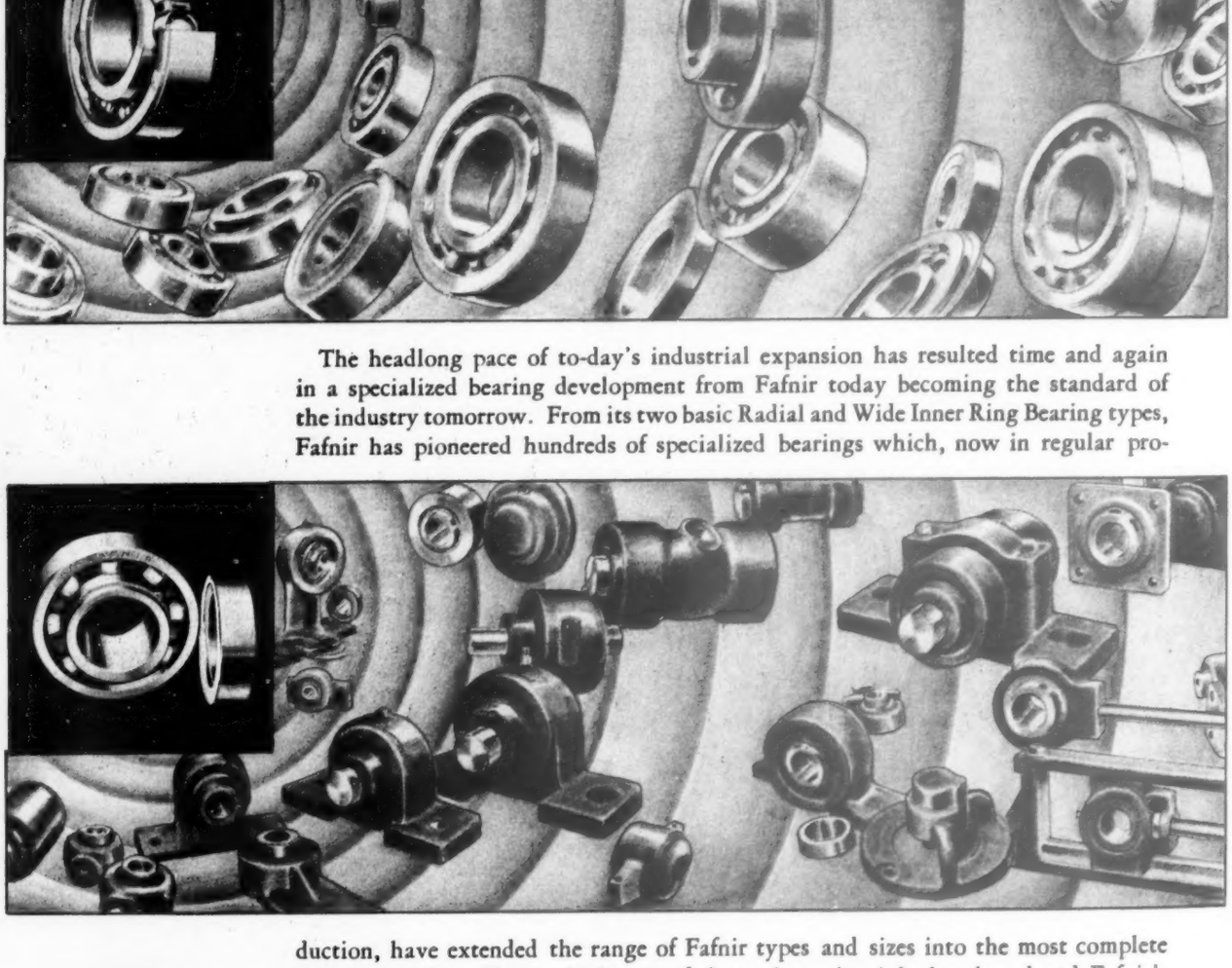
FAFNIR BALL BEARINGS

THE BALANCED LINE . . . MOST COMPLETE IN AMERICA

"STANDARD" AND "SPECIALIZED" ARE *Sisters Under the Skin*



The headlong pace of to-day's industrial expansion has resulted time and again in a specialized bearing development from Fafnir today becoming the standard of the industry tomorrow. From its two basic Radial and Wide Inner Ring Bearing types, Fafnir has pioneered hundreds of specialized bearings which, now in regular pro-



duction, have extended the range of Fafnir types and sizes into the most complete line in America. Every single one of these pioneering jobs has broadened Fafnir's experience—added to Fafnir's ability to pioneer further as industry reaches into newer fields—so that to-day, Fafnir offers to standard bearing users *the most complete line;* and to those whose demands are specialized, *the most complete store of experience,* resulting from building that line. The Fafnir Bearing Company, New Britain, Conn.

Send for
Engineering Manual No. 35

FAFNIR BALL BEARINGS

THE BALANCED LINE . . . MOST COMPLETE IN AMERICA

THE AVIATION NEWS

REVIEW, COMMENT, FORECAST

DANIEL SAYRE
C. F. McReynolds, *Pacific Coast*
Blaine Stubblefield, *Washington*
E. R. Lockin, *New York*

NOVEMBER 1937

Roper OKs New Civil Air Regulations

Fagg's Code Affects All Airmen
Director Stays to Job's End

FRED FAGG, the tall, lantern-jawed law professor who last March stepped into the Directorship of a badly disorganized Bureau of Air Commerce, resigned Oct. 4. He had accepted Northwestern University's invitation to come back and head its School of Commerce. Fagg has indicated, however, that he will stay at the Bureau for a number of months,—he has some jobs he intends to finish.

There is the Bureau's big program for improving and extending airway aids. With all the speed possible under government procedure, that won't start showing results out on the airlines until spring. There is the reorganization of Bureau departments and personnel which started immediately upon Fagg's arrival but is not fully completed. Finally there is a matter which was engaging Fagg's principal efforts a year before he became Director—the complete codification and redrafting of all the huge mass of uncoordinated rules and regulations that have grown up around civil flying in three decades.

To help him at this last-named task, Fagg has from the start had the collaboration of John H. Wigmore, Dean Emeritus of Northwestern's Law School. Since Fagg took on the Directorship, Howard Knotts, another wartime flyer and a brilliant practicing lawyer from Illinois, has been carrying on the direct labors of the project.

Last month Fagg's new code was nearly done—in a sense. The big majority of its many chapters had been signed by Secretary Roper; appeared serially in the Federal Register; and became law, effective (save in a few minor particulars) Nov. 1. As soon as the Government Printing Office gets through printing 60,000,000 forms for the unemployment census, you will probably be sent those chapters directly concerning you, if you happen to be on the Bureau mailing list. Or you can write in for the whole business or any part of it, if you're interested.

And you'd better be interested. These new Civil Air Regulations (better get used to call them the C.A.R. or just CAR) are going to keep the people you talk aviation shop-talk with, arguing all winter. Whether they are fieldboys, mechanics, students, pilots (all grades), airport operators, officials, airline projectors, executives, dispatchers, flying school operators, manufacturers, or even model builders, this thing is going to affect their status and relationship with aviation in some way.

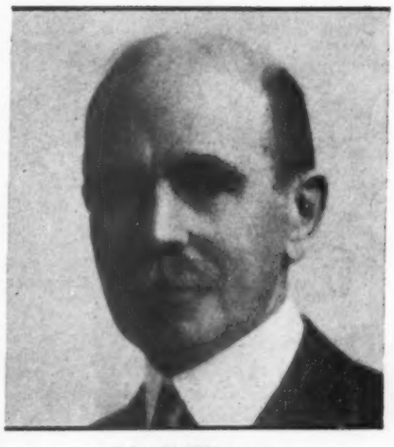
It's a helluva thing, this C.A.R. If you sit down cold to wade through its hundred big small-print pages you will curse the lawyers' language and the lawyers' exhausting thoroughness and repetition. But for the first time (the experts tell us) just these things make these rules rest soundly on powers the enforcing agencies really possess.

And they are not all the same old rules either. There are hundreds of items really set down here for the first time—products of the last few years of intense design and flying progress. And—hitting more of us than any other section—a complete overhaul of all student and pilot's ratings.

On following pages is our best efforts to abstract these new factors. The impression one gets from the C.A.R. itself is of a colossal, conscientious effort to increase the safety of all flying to as great a degree as human nature

Fred Fagg

Howard Knotts



John H. Wigmore

and the state of the art permits. If you have criticisms, objections, suggestions, for this thing's betterment, send them—not to us—but to Fagg. He and his associates have consulted scores of representatives from each interest in American aviation—including the Army and the Navy—and have won their broad approval. But Fagg is broadcasting an invitation for individual and detailed reactions, and the code is full of "Proceedings to Amend." He's staying in Washington, from all accounts, largely to see C.A.R. through to a finish.

The Rules and Regulations which CAR supplants were, if available at all, printed in many and varied forms. CAR will appear in an even hundred uniform "chapters", each printed separately on an 8½ x 11 sheet or in a booklet of that size. Homework Assignment No. 1 is to learn the indexing system upon which CAR is arranged. Technically it is known as the "Dewey Decimal System" and isn't much different from that numbering system most libraries use to classify books. Each group of ten chapters covers some wide aspect of the field. Each chapter is devoted to some single subject and is assigned some number 00. to 99. For example, chapter 04. will cover airplane airworthiness requirements. Numerals after the decimal point indicate specific subdivisions and sub-subdivisions of the chapter subject. For example, 04.4 refers to regulations on detail design; 04.43 refers to the detail design of control systems; 04.431 refers to the detail design of control system stops. This of course sounds complicated, but after you have spent your first half-hour

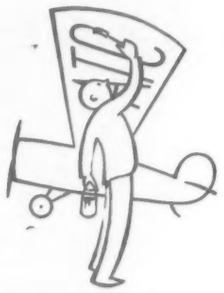
with CAR you will swear by it in preference to the old-time "somewhere toward the back of pamphlet 7-G".

Homework Assignment No. 2 is to get over calling anything a "license". There are no "licenses" provided in all of CAR'S hundred chapters. Instead, get used to the terms "airworthiness certificate," "certificate of competency". Also the word "certificated" meaning licensed or certified in the old sense. Why? Well, at law a "license" is a permission to do something that is not an inherent right. And flying is or should be completely understood to be such an inherent privilege. Besides the Air Commerce Act of 1926 doesn't say "license" anywhere, but gives directions for the issuance of certificates and the certifying of fitness of one sort and another. It's hard for a layman to believe but we are told that for years just such types of minute inconsistencies have actually made some of the old rules legally unenforceable; and certainly nobody made up "certificated" just because it sounded pretty. Fortunately, after this lesson you will find few other lawyers' jawbreakers in CAR to bother you. With no more dual instruction we may get started with CAR 00. et sub.

Chapters up to CAR 19. are devoted to the regulations concerning the aircraft itself. Sample headings are Aircraft Registration Certificates, Aircraft Airworthiness Certificates, Aircraft Title Transfer, Glider Airworthiness, Aircraft Propeller Airworthiness, Aircraft Repair and Alteration. As is typical of all the class groups, some of these numbers are not yet assigned, will therefore be available say for Rocket Car Airworthiness if, when, and as. Also typical of all sections is a careful and to a layman, almost irritating, repetition of specifying methods by which rules, regulations, certificates can be amended, revoked, suspended, and so on. You'll just have to take this straw along with the grain. It may turn out some day to be just what you need to make bricks with.

But to get back to the subject matter, for all practical intents and purposes the process you will go through when you buy a plane is identical with the current regulations. However, here for the first time comes this certificated business. Airplanes will no longer be licensed and identified, but will be first registered for the purposes of identification, then certificated as airworthy. These are the changes. A foreigner may no longer own an American registered aircraft, even for non-commercial purposes. All American aircraft identification marks will begin with the letter N, followed by either the letter C, R, X, (with present meanings) or a long dash designated the "bar" symbol. This bar symbol will indicate a plane whose status corresponds roughly to that of present "identified" ships. Much more importantly, airworthiness certificates will henceforth be classified as to one or more operations: (a) non-airline carrier; (b) airline carrier (goods); (c) airline carrier (passengers); (d) visual-contact flying; (e) instrument flying; (f) day flying; (g) night flying; (h) no passengers at any time; (i) flights only within 100 miles from base; (j) special industrial.

Following through from these new specific ratings to be entered on the aircraft's certificate, one finds the only new departures in the chapters dealing with type certificates which for the first time give full details of radio and instrument equipment required for non-airline planes that intend to do instrument flying. This for example includes two-way radio; a turn-and-bank; a sensitive altimeter; a clock with sweep-second-hand; storage battery; generator; and spare fuses. The old ATC rating, incidentally, is here specifically split up between a type certificate which certificates the plane's design and construction and a production certificate which certificates the competency of a factory to produce planes satisfactorily uniform with the prototype. A note for harrassed airport officials,—landing speeds for



planes of 30,000 pounds or more have been raised from 65 to 70 m.p.h.

The chapters from 20. through 29. are devoted to air men,—pilot rating, ground instructor rating, mechanic rating, etc. Here, for the big majority of us, lie the really major new departures of CAR over preceding regulations. Again much in CAR is an exact duplicate or a mere re-phrasing of the old stuff we are used to. For example, specific physical requirements for private and higher ratings remain almost exactly the same. Flight test requirements for various grades are changed only in slight detail and in being set forth more specifically. But the rest is pretty well shuffled. Basic of course is the change of title from license to certificate of competency. Specific titles and hour allowances are completely re-worked, in most grades. Just to refresh your memory, regulations in effect up to November 1st required a medical examination for a student pilot; to get an amateur rating you needed 25 hours solo, but there was no minimum dual specified; to get a private or a limited commercial you needed 50 hours solo. A glance at the CAR rules below shows the contrast immediately. We have omitted only items which are exactly or substantially similar to the old rules.

In the following excerpts from CAR we have made no attempt at completeness but have selected a few of the more important items which we believe will be of particular interest to our readers. The various pilots' ratings are typical examples of the regulations that affect most of us.

Student Pilot Rating:

20.100. Age—Applicant shall be at least 16 years of age.

20.105. Aeronautical Knowledge—No minimum requirement is prescribed but, prior to his first solo flight, applicant shall be familiar with the provisions of CAR 60, and such fact shall be certified to by his instructor.

20.106. Aeronautical Experience—No minimum requirement.

20.107. Aeronautical Skill—No minimum requirement is prescribed but, prior to his first solo flight, applicant shall have had a minimum of 8 hours dual flight instruction and shall have been deemed, in the opinion of his instructor, competent to make such flight, and such competence shall be certified to by his instructor on the student pilot certificate in the place provided therefor. . . .

Solo Pilot Rating:

20.115. Aeronautical Knowledge — Applicant shall be familiar with and accomplish satisfactorily a written examination on . . . CAR 00, 01, 02, 03, 20, 30, 60, 90, 91, 94 and 98, as . . .

20.116. Aeronautical Experience — Applicant shall have logged at least 5 hours of solo flight time, of which at least 3 hours shall have been logged within 60 days last preceding the date of filing the application. . . .

20.117. Aeronautical Skill—Applicant shall demonstrate satisfactorily his ability to pilot aircraft in solo flighs including normal take-offs, turns and landings.

Private Pilot Rating:

20.125. Aeronautical Knowledge—Same as in CAR 20.115 and, in addition, applicant shall satisfactorily accomplish a written examination covering . . . weather . . . and the forecasting thereof . . . practical air navigation problems . . .

20.126. Aeronautical Experience — Applicant shall have logged at least 35 hours of solo . . . As part of the foregoing, applicant shall have logged at least 5 hours of solo cross-country flying . . .

Limited-Commercial Pilot Rating:

20.130. Age—Applicant shall be at least 18 years of age.

20.135. Aeronautical Knowledge—Same as in CAR 20.125 and, in addition, applicant shall satisfactorily accomplish a written examination on the theory and the practice of flight and the maintenance of aircraft, and on the maintenance and proper use of aircraft power units in common use.

20.136. Aeronautical Experience — Applicant shall have logged at least 60 hours of solo flight time . . . Solo cross-country flying time as provided in CAR 20.126.

20.137. Aeronautical Skill—Same as in CAR 20.127 except as follows:

Commercial Pilot Rating:

20.145. Aeronautical Knowledge—Same as in CAR 20.135 except that the examinations will be more searching and in greater detail.

20.146. Aeronautical Experience — Applicant shall have logged at least 200 hours of solo flight time . . . As part of the foregoing applicant shall have logged at least 10 hours of solo cross-country flying, which shall include at least one flight over a course of not less than 100 miles with at least three full stop landings at different points on such course. . . .

Instructor Rating:

20.200. Age—Same as in CAR 20.130.

20.201. Aeronautical Knowledge — Applicant shall have practical and theoretical knowledge of flight instruction and shall accomplish a satisfactory written and practical examination thereon.

20.202. Aeronautical Experience — Applicant shall be possessed of a valid commercial or private pilot rating, provided that in the latter case he meets the requirements of CAR 20.146.

20.203. Aeronautical Skill—Applicant shall satisfactorily accomplish a practical flight test as to his ability to perform with precision and teach properly such fundamental flight maneuvers as are, in the opinion of the Secretary, deemed necessary and appropriate for safe and sound instruction in the safe piloting of aircraft.

20.21. Instrument Rating—To be eligible for an instrument rating, an applicant shall comply with the following minimum requirements:

20.210. Aeronautical Knowledge — Applicant shall be familiar with the use of such instruments and other navigational aids, both in aircraft and on the ground, as are deemed by the Secretary to be necessary for the navigation of aircraft by instruments, and with meterology as applied to weather analysis and forecasting, and the applicant shall satisfactorily accomplish a written examination thereon.

20.211. Aeronautical Experience — Applicant shall have logged at least 200 hours of solo flight time as prescribed in CAR 20.146, including a minimum of at least 20 hours of instrument flying instruction and practice, and shall be possessed of a valid private, limited-commercial or commercial pilot rating. In lieu of not to exceed 10 hours of the foregoing 20-hour requirement applicant may show an equal or greater amount of instruction and practice under suitable conditions approved by the Secretary. Applicant shall also be possessed of a valid and appropriate radio license issued by the Federal Communications Commission.

20.30. *Provision for Issuance:* An appropriate pilot certificate of competency will be issued . . .

(a) If the holder of a student license, a *solo certificate*, provided he has logged at least 5 hours of certified solo flying time and makes application within the effective period of his license. If the holder of a student license with no or less than 5 hours solo flying time, a *student certificate* . . .

(b) If the holder of an amateur license, a solo certificate.

(c) If the holder of a private, limited-commercial or transport license, a private, limited-commercial or commercial certificate respectively, plus an instrument rating if a non-scheduled instrument rating is held and, in the case of the commercial pilot certificate, an instructor rating whether or not a flying instructor's rating is held.

20.34. *Duration:* A pilot certificate of competency, unless sooner suspended or revoked in accordance with the provisions of CAR 20.37, will remain in force for the following periods, for the respective kinds of certificate:

20.340 (a). Student pilot—1 year
20.341 (b). Solo pilot—1 year
20.342 (c). Private pilot—1 year
20.343 (d). Limited-commercial pilot—6 months
20.344 (e). Commercial pilot—6 months
20.345 (f). Airline pilot — 6 months (See CAR 21)

20.55. *Aircraft Weight and Engine Classification:*

(a) Class 1—Gross weight not more than 1,500 pounds.

(b) Class 2S—Gross weight between 1,500 and 4,000 pounds, single-engine.

20.60. *Certificate Required:* No person shall pilot a civil aircraft on a civil airway, or in interstate or foreign air commerce elsewhere, unless possessed of a valid pilot certificate of competency or, if an alien, possessed of a similar pilot certificate or permit, issued or validated according to the provisions of CAR 65. Accordingly, no person shall make a solo flight of civil aircraft on a civil airway, or in interstate or foreign air commerce elsewhere, unless possessed of such certificate, but, prior to such solo flight, no pilot certificate will be required of a person who is flying with a certificated instructor in an aircraft equipped with fully functioning dual controls as provided in CAR 20.53, and provided further, that said instructor is in full charge of one set of said controls. Even then such flights shall be only for instruction or the demonstration of the aircraft to a bona fide prospective purchaser thereof.

Airline Pilot Rating:

21.10. Age—Applicant shall be at least 23 years of age.

21.16. Aeronautical Experience — Applicant shall comply with the following requirements:

21.160 (a). Applicant shall be possessed of a valid commercial pilot rating, or equivalent as determined by the Secretary.

21.161 (b). Applicant shall have logged at least 1,200 hours of certified solo flying time within the last 8 years, of which at least 500 hours shall have been in cross-country flight, and of which at least 5 hours of solo flying time shall have been logged within the 60 days last preceding the date of filing the application.

21.162 (c). Applicant shall have logged at least 100 hours of solo night flying . . .

21.163 (d). Applicant shall have had at least 20 hours of instrument flying instruction and practice. In lieu of not to exceed 10 hours of the foregoing 20-hour requirement applicant may show an equal or greater amount of instruction and practice under simulated conditions approved by the Secretary.

21.270. Automatic Invalidation — Any physical deficiency, or any increase in physical deficiency, which occurs at any time within the effective period of an airline pilot certificate and which is not compensated for by some additional excellence as provided for in CAR 21.252, will automatically cause such pilot certificate to become invalid for the period of such physical deficiency.

Aircraft Mechanic Rating:

24.105. Aeronautical Experience — Applicant shall have had at least one year of practical experience in the construction, maintenance, or repair of aircraft.

24.11. Aircraft Engine Mechanic Rating:

24.115. Aeronautical Experience — Applicant shall have had at least one year of practical experience in the maintenance, repair and overhaul of aircraft engines.

Junior Control Tower Operator Rating:

26.100. Age—Applicant shall be at least 22 years of age.

26.103. Education—Applicant shall be able to read, write, and understand the English language, shall be able to speak the English language without accent or impediment of speech which would interfere with intelligible two-way radio conversation, and shall be a high-school graduate or its equivalent.

26.1040 (a). Eye—Applicant shall have a visual acuity of at least 20/20 in each eye separately without correction; an average depth perception of 30 millimeters or less without correction . . .

26.105. Aeronautical Knowledge — Applicant shall be familiar with and accomplish satisfactorily an examination on

26.1050 (a). airway traffic control procedure (See CAR 60),

26.1051 (b). airline schedules at the airport for which he seeks to be rated,

26.1052 (c). airport traffic control regulations for the airport for which he seeks to be rated, and

26.1053 (d). teletype symbols and weather sequences on airways converging on the airport for which he seeks to be rated.

26.106. Aeronautical Experience—No minimum requirements.

Associate Airport Control Tower Operator Rating:

26.110. Age—Applicant shall be at least 25 years of age.

26.113. Education—Same as CAR 26.103.

26.114. Physical Requirements—Same as CAR 26.104, except that vision of 20/30 will be permitted provided applicant has served satisfactorily, in the opinion of the Secretary, as an airport control tower operator for a period of 6 months during the year immediately preceding his application.

26.115. Aeronautical Knowledge—Same as in CAR 26.105, and in addition the applicant shall be familiar with and accomplish satisfactorily an examination on

26.1150 (a). airline operation procedure at the airport for which he seeks to be rated,

26.1151 (b). air navigation facilities within 200 miles of the airport for which he seeks to be rated,

26.1152 (c). air traffic rules as provided in CAR 60,

26.1153 (d). the current Consolidated Interline Safety Agreement, and

26.1154 (e). airline and itinerant radio frequencies and radio procedures.

26.1164 (e). shall possess an appropriate valid radio license issued by the Federal Communications Commission.

26.117. Approval by Examining Board.

26.1170 (a). An applicant shall be given an examination by a board appointed by a designated representative of the Bureau and composed of at least 3 members, one selected from the airport management and the others from airline operation departments, Bureau representatives and military aviation units on the airport or from among other competent aeronautical officials having personal knowledge of the qualifications of the applicant and the duties to be performed.

Senior Airport Control Tower Operator Rating:

26.120. Age—Same as CAR 26.110.

26.124. Physical Requirements—Same as CAR 26.114.

26.125. Aeronautical Knowledge — Same as CAR 26.115.

26.136. Aernonautical Experience — Applicant shall have

26.1260 (a). Performed satisfactory service as an associate airport control tower operator for at least one year or have

26.1261 (b). performed satisfactory service for the 6 months immediately preceding application as the operator in charge of the control tower at the airport for which he seeks to be rated, and shall

26.1262 (c). demonstrate satisfactorily his ability to supervise and manage all activities of an airport control tower.

26.127. Approval by Examining Board—Same as CAR 26.117.

Dispatcher Rating:

27.100. Age—Applicant shall be at least 23 years of age.

27.103. Education—Applicant shall be able to read, write and understand the English language, and speak the same without accent or impediment of speech that would interfere with two-way radio conversation.

27.104. Aeronautical Knowledge — Applicant shall be familiar with and shall accomplish a satisfactory written examination on:

27.10400 (a). The provisions of CAR 40 and 61 and those parts of CAR 60 which apply to dispatching.

27.10401 (b). The characteristics of at least one make and model of airline aircraft . . .

27.10402 (c). The general system of weather collection and dissemination.

27.10403 (d). Weather map, forecast and sequence abbreviations, symbols and nomenclature. The general principles of modern methods of weather analysis . . .

27.10404 (e). Cloud forms . . .

27.10405 (f). Weather conditions adversely affecting aeronautical activities . . .

27.10406 (g). The influence of terrain upon meteorological conditions . . .

27.10407 (h). Elementary principles of radio communications and radio range operations . . .

27.10408 (i). Department of Agriculture Weather Bureau Circular "N", Instructions for Airway Meteorological Service . . .

27.10409 (j). Air navigation facilities in use on the civil airways . . . fields.

27.10410 (k). Elementary principles of aircraft navigation . . .

(Turn to page 57)

Glenn Martin Reports

Splendid Nine Months Figures

GLENN L. MARTIN COMPANY of Baltimore reports third quarter sales of $3,218,750.66, with net earnings (after all appropriate charges for depreciation, experimental and development expense, and taxes, but without provision for possible excess profits and undistributed earning's taxes) of $492,532.11. These earnings equal fifty-six cents (56c) per share for the third quarter, or $1.17 per share for the nine months ended September 30, 1937. As of September 30th, there were 870,041 shares outstanding. Total net earnings for the nine months to September 30th are $1,018,839.47.

The Martin's back-log of undelivered orders has increased materially. As of September 30, 1937, the back-log totalled $13,490,329.00. On June 30, 1937, the back-log was only $11,406,663.00. Since third quarter sales totalled $3,218,750.66, it is apparent that new business, not publicly announced, has been accepted by the company in the total sum of $5,302,416.66.

1937 Production Soars

DELIVERIES by American aircraft and aircraft engine manufacturers totalled $71,723,589 the first eight months of 1937, as compared to $42,311,526 for the same period last year, according to a statistical report made public last month by Leighton W. Rogers, president of the Aeronautical Chamber of Commerce of America. The 1937 figures represent an increase of 69.5 per cent over the eight months of 1936. Rogers estimated that the total sales this year will be about $110,000,000, approximately 45 per cent above 1936, which was the industry's record year.

Westinghouse to Rush Beacons

A BUREAU OF AIR COMMERCE CONTRACT, amounting to $700,000, has been awarded the Westinghouse Electric and Manufacturing Company for 44 radio range stations of the improved simultaneous type which permit continuous transmission of "on course" signals without interruption for weather broadcasts. Starting next March, 1938, installation of the new stations will be made at the rate of six each month until the 44 ordered have been placed in service.

Wasps for the Ausies

PRATT AND WHITNEY AIRCRAFT have granted a license to the Commonwealth Aircraft Corporation Proprietary, Ltd., of Melbourne, for the manufacture of the series H Wasp in Australia. Selection of the Wasp as the first engine type to be built as part of an Australian program of national defense is reported to have followed a visit by an Australian to factories in England, France, Germany, Holland, and the United States. Commonwealth Aircraft will also manufacture the North American NA-16 two seater under a similar license.

Corps Buys More Boeings

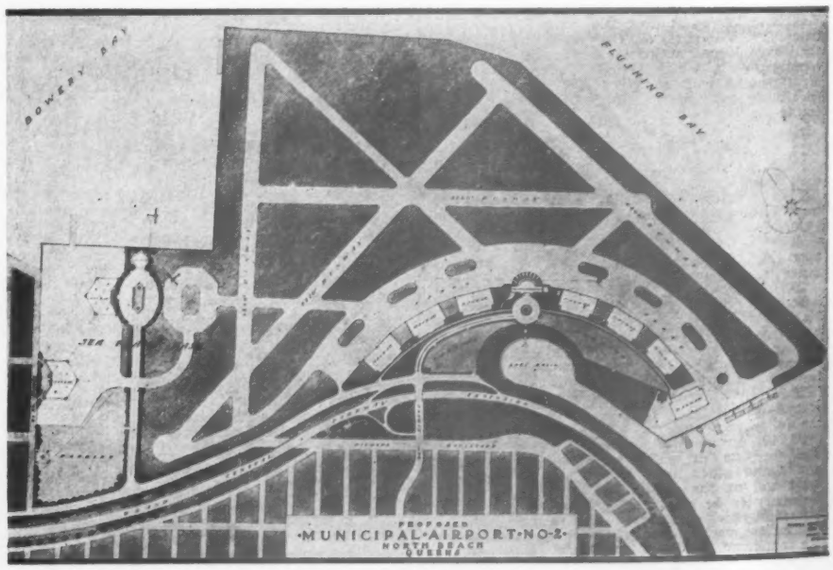
Thirty-Ninth Fortress on Order

THIRTEEN MORE B-17B four-engined bombers with spares equivalent to two complete ships were ordered last month. Total price involved: $2,518,346. Deliveries for a first order of thirteen were completed this summer at about the same time a second thirteen (with spares for two) were contracted for. This current order when completed late next year or early in 1939 will give the Air Corps thirty-nine of these huge ships, not counting spares. Like the earlier YB17 the new "fortresses" will be powered with four Wright G Cyclones; have speeds "over 225 m.p.h."; carry a crew of seven to nine, five machine guns and a heavy bomb load.

The Boeing Company will assemble the 26 B-17Bs it now has on order in the newly doubled addition to its main plant. This addition now has a floor area of 135,000 sq. ft.; its balcony 21,000 sq. ft. The main plant will continue to turn out basic parts and serve as erecting space for the huge ocean flying boats Boeing has also under way.

Major General Oscar Westover, Chief of the Air Corps, intimated last month that the original thirteen of the fortress fleet may soon be sent on a mission to Hawaii and return.

Meanwhile, on Oct. 16, the big super fortress, the Boeing XB-15, piloted by Edmund T. Allen and with Maj. John D. Corkill, U. S. Army, serving as co-pilot, took off from Boeing Field, Seattle, on a first but highly successful test flight.



DIGGING IN: Fiorello La Guardia, wartime aviator and present mayor, breaks ground for New York's new super-airport project—a combined land and sea terminal at North Beach, twenty minutes from mid-town hotels. Runways will be over 4,000 ft. long. Temporary marine facilities are to be ready for trans-Atlantic operations next Spring. Estimates of final cost run from $8,000,000 to $15,000,000. Chief Flaw—The old field's operators and private flyers have been summarily dispossessed. O. J. Whitney and most others have moved to Floyd Bennett; a few have set up at Roosevelt Field

AVIATION

IN WASHINGTON

inside news and comment on aeronautical affairs within the Nation's Capital by BLAINE STUBBLEFIELD

» "Untangle, re-write, and coordinate the maze of conflicting air transport legislation left in a heap by the last session of Congress." That is the assignment handed the President's Interdepartmental Committee on Civil Aviation Legislation appointed by Secretary of Commerce Roper. The course of air development in the next decade may depend upon what these six men do.

The industry has offered no criticism of this move; it is fully cooperative and hopeful. But some leading airmen in Washington express doubt that the committee can write a practical program. The pending bills represent mostly the demands of government departments warring for authority over air transport. Some of those factions will have to be appeased or stepped on. If they are mollified with further illogical division of authority, nothing will have been gained.

Assistant secretaries of State, Treasury, War, Navy, Commerce and the second assistant to the Postmaster General being on the committee would indicate the intention is to formulate a national policy and program. Only Commerce and the Post Office are directly interested in air transport as such; War and Navy of course are vitally concerned from a defense standpoint. Agriculture, the mother hen of the Weather Bureau, is, oddly enough, not represented. Omission of the Interstate Commerce Commission and the Maritime Commission, while they are not strictly eligible in a Departmental group, caused immediate comment. ICC's sole function in transportation is convenience, necessity, and safety regulation—an independence which is attractive to aviation. The Maritime Commission has made passes at regulation of off-shore airlines.

All of the six committee men have other pressing duties, and two-thirds of them are supposed to have little knowledge of air transportation. For these reasons and because the time is short, some critics say sound results cannot be expected. Others retort that Joseph Kennedy, chairman of the new Maritime Commission, was no seaman, but he got results, quick.

» Some observers wonder whether the President really asked for this committee, or whether he merely sanctioned it. Those who think it's a White House committee believe it is a move to whip into shape a program that can be passed when Congress meets, as a face-saver for the President, who months ago asked that air be placed in ICC along with other transportation. Others say it's a tactic by the Post-Office-Commerce combination to oppose the McCarran ICC control and safety bills. The PO-Commerce team, they say, may hope to enlist the support of other Departments against the two ambitious commissions. As usual the President is the X in the equation.

» Secretary Roper said his committee would also work on legislation for U. S. foreign air transport, which is now proceeding in policy-fog as thick as the home stuff. This will be a tough one because four dogs are after this one biscuit: Post Office, Department of Commerce, Maritime Commission, and the Interstate Commerce Commission.

» Grover Loening's report on application of the maritime subsidy and other laws to ocean air transport is still in ferment. All or part of it will be released in connection with the Maritime Commission's general report on merchant marine near the first of November. Some of Loening's report has been passed to the Roper Committee. Only insiders know what it says. You can add up these facts and make your own guess: shipping companies see airplanes getting bigger than their own boats used to be; going ten times as fast; beating their pay-load-to-weight ratio all hollow; threatening their rates. Shipping men are thinking about airplanes to protect and augment their trade routes, and *telling* the Maritime Commission.

» The big duck ruffling the oversea puddle is Pan American. You find aviation Washington divided into three schools. Our foreign air system should be one company—Pan American; our foreign air system should be one company, nationalized; our foreign air system should be several companies in competition, because the benefits of competition apply to foreign air commerce as to any other business. It seems doubtful if the Roper Committee or the Maritime report will settle this one yet awhile.

» What foreign policy will eventually be adopted depends upon which government authority gets control of overocean. The Commerce Department's deal with England, under authority of the air commerce act, whereby not PAA but the United States owns the transatlantic agreement with Imperial Airways, applies not only to PAA but to any operator that might, for any reason, supplant PAA on that run. You don't need a smoke bomb to get the direction of *that* wind.

» Western Air with its new Idaho-Montana hookup has its eye on a U. S.-Alaska line. Anthony Joseph Diamond, delegate from Alaska, tells us that service to his Northland will some day be big and prosperous. But some who know about the new trans-Canada system say it will try to capture the bulk of that business by providing a fairly direct run from Alaska to New York, which will supply the bulk of traffic. Much depends on air mail deals with Canada, and on a change in Alaska, which now has star routes.

» John Geisse, longtime apostle of the old three-wheel carriage, as he worked in aircraft development of the Bureau of Air Commerce, must feel some sort of satisfaction as he sees tricycles blooming in the new-plane ads.

» When the Air Corps will occupy its new peace-time base, Bolling Field, is uncertain, pending appropriation of money by Congress to erect necessary buildings. If any transport operators move to Bolling from Hoover, they will be permitted to erect temporary buildings. Contrary to reports, Bolling will charge them a tenant fee if they come, and their welcome will not be permanent. A seawall built of salvaged broken concrete is among the neat construction tricks. The beautiful system of runways is completed.

» With new money from Congress the Bureau of Air Commerce has added seven airline and maintenance inspectors to its staff of 42. Ed Yuravich, who has played a lone hand in foreign service inspection, will have three assistants. General inspection (stations, factories, pilots, etc.) has 36 new men; about half are assigned and half are in preliminary training. General inspectors are now classified junior and senior, based on age and experience. Juniors must have 1000 hours in the air, seniors 2000. About half the freshmen are juniors.

» There is question whether the Administration would permit aviation on its calendar with crop control, wages and hours, and government reorganization in the special session called for November. Supporters of the McCarran bills are undecided whether they would get the best play then or in January. But they are ready for action in November. One thing they feel sure of: the committee cannot write a program sufficiently practical and airtight in so short a time to please the industry and congress. It will start another dog fight.

FIFTY MILLION MILES A YEAR

Position Reports on Airline Progress by DAN SAYRE

Oxygen-lack at 10,000 ft. turns out not so much of a horny-headed hazard as a few of the second-guessing experts would have us believe last summer. At last month's annual convention of the Aero Medical Society, held in New York City, one of the world's leading researchers on the subject, Dr. R. A. McFarland of Harvard, went into the matter at full length. Earlier he himself had thought that laboratory tests in vacuum chambers gave conclusive proof that altitudes, even as low as 8,000 feet, should have a noticable effect upon a pilot's efficiency. Then last summer he went along on one of the regular Pan American Clipper flights from San Francisco to Manila and return. He found the pilots' acclimatization processes remarkable. Before, during, and after the long 125 hour assignment he found that the whole crew functioned with a high degree of physical and mental fitness. Tests on their blood showed a ten per cent increase in red cells between the start and finish of the trip—this in spite of the fact that the flying was done continually at altitudes between 8,000 and 11,000 feet.

United has ordered 28 Wasps of the Series 1830-C type, according to recent word from Hartford. As rated by the Bureau of Air Commerce these 14-cylinder twin-row plants will each turn out 1200 hp. when using 100 Octane gasoline. United will use them to power the ten new DC-3s it has on order for early 1938 delivery.

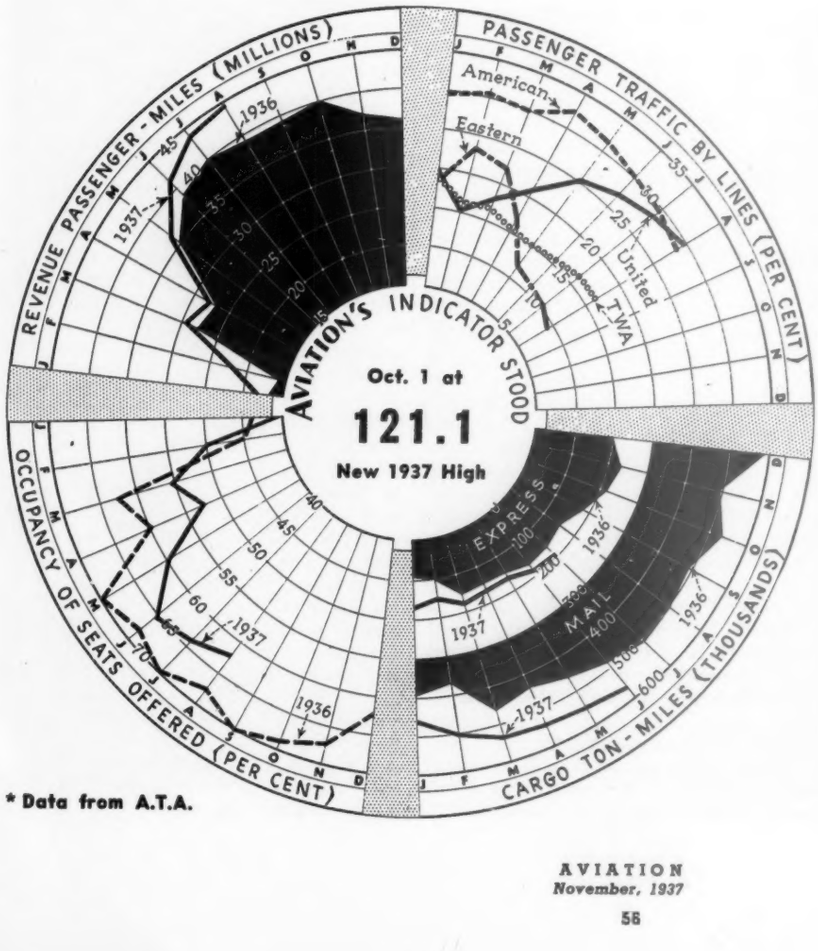
Eastern's getting set for a rush of passengers this winter far beyond any of its big peak loads of past seasons. Captain Rickenbacker said last month that the line's September traffic broke the 1936 record by 34 per cent. No less than 11,852 revenue passengers had availed themselves of Eastern services during the thirty day period.

TWA now includes Oakland in the ports of call on its new services into San Francisco. Since Oct. 1 all four daily flights, including the two which are otherwise non-stop between Albuquerque and San Francisco, will call for and discharge revenue passengers at the populous cross-Bay city.

Somthing new in noses for transport planes is the latest style note from Burbank. Northwest Airlines has ordered plexiglass radio compass loop housings fitted in the nose of all their new Lockheed-14 fleet. Tests have shown less static, less loss of signal strength, less drag (about 2 m.p.h. at top speed).

Something new in airlines got under way last month when Airline Feeder System, Inc., got off to a flying start with a service between Newark and the Connecticut Valley towns of Bridgeport, New Haven, Hartford and Springfield. Using Stinson A trimotors, two daily round trips are so scheduled to give the best connections possible with through schedules at Newark. If this first venture proves a success the company has plans for establishing other similar feeders out of Newark into Delaware, Pennsylvania, New Jersey and New York State. President of the new company is Alton B. Sherman, long director-pilot of Hyannis (Mass.) Airport, and a leading New England operator.

A new scheme of pilot pay intended to reward judgment in not flying under doubtful weather conditions has been installed experimentally by United Air Lines and will be effective through the coming winter. The plan is to abolish temporarily the time-honored system under which well more than half of a domestic air line pilot's pay has heretofore depended upon his time in the air, the number of scheduled trips taken out, and the number completed. In its place United Air Lines will raise the base payment up to a minimum flight pay guarantee bringing each pilot a monthly salary throughout the winter of approximately the same level as he has averaged throughout the past year. In effect the new method of payment will be equivalent to the fixed monthly salary completely independent of hours flown that has long been paid on the Pan American Airways system with excellent results.



* Data from A.T.A.

(*Continued from page* 53)

27.105. Aeronautical Experience — Applicant shall

27.1050 (a). have been listed as a dispatcher in the airmen competency letter of an airline and have served as a dispatcher for such airline for at least 6 months . . . or

27.1051 (b). have served as a first or second pilot for a certificated airline for at least one year . . . and have served as a dispatcher for such airline for at least 3 months . . . or

27.1052 (c). have served for 2 years . . . in the operations department of a certified airline, or

27.1053 (d). be a graduate of an airline dispatcher course of a certificated flying school, which course is deemed by the Secretary to offer the equivalent of CAR 27.1050 through 27.1052.

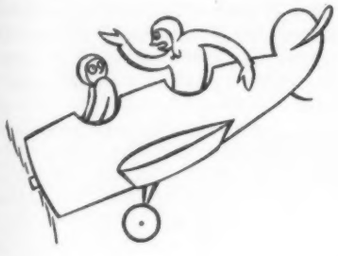
27.1054 (e). On the effective date of these regulations and for 6 months thereafter an applicant employed or formerly employed for the purpose of the dispatching and flight control of aircraft in airline service may be deemed by the Secretary to have met the requirements of CAR 27.105, and if so deemed, shall be presumptively entitled to an airline dispatcher rating.

27.106. Aeronautical Skill—Applicant shall be able:

27.1060 (a). To make a reasonably accurate and intelligent analysis of a series of Weather Bureau 6-hourly maps . . .

27.1061 (b). To make an accurate and detailed analysis . . .

Just how these will affect the local operating business is going to be open to catch-as-catch-can debate for



months. Note the following just in case your discussions begin to run down. The student pilot does not have to take a medical examination until he is ready to solo. Minimum dual time is specified at eight hours. Private requirements however have dropped from 50 to 35 hours solo. Spot that regulation against instruction in any ships without two complete control systems. Spot the provision that makes every present transport pilot be the recipient of the new special instructor rating without test until he has finished a first six months' period. Note the provision in car 20.211 for taking some of your instrument training on a Link Trainer. But you go ahead and spot what is of most interest to yourself.

Chapters 30. to 39. will be devoted to the certification of air navigation facilities which will include airways, emergency fields, airports, etc. None of this has yet been published. Most of the important chapters are scheduled to be ready January 1, 1938, others a month or two later.

Chapters 40. to 49. go to town on the subject of air carriers. Here, too, a number are not yet finished, notably those dealing with foreign carriers, and some remain unassigned. But 40. et sub. have a number of interesting provisions concerning scheduled airline certifications. 40.10, for example, specifies "Applicant shall show economic and financial strength sufficient to establish a presumption of ability to operate the air line with reasonable safety as related to the service offered for a period of at least one year". Before this one becomes very effective there has got to be some tall setting up of standards, bookkeeping methods, and whatnot. 40.200 provides that airlines must fly only within the limits of a civil airway and further provides that if an airline is set up on some route that has not yet been so designated, the applicant can request that it be so designated. 40.201 provides that each airport used as a scheduled terminal or intermediate stop must be possessed of a valid airport competency rating, with relation to the specific aircraft to be used. The section dealing with equipment requirements for an instrument and/or over-the-top operation, specify the radio communications equipment in considerable detail. Also required, effective January 1, is a radio direction finder and effective immediately, a radio antistatic antenna.

The 50. chapters are devoted to air agencies,—so far only assigned chapters are flying schools and aircraft repair stations. To us, at least, there seem to be no substantial deviations in CAR relating to repair stations from past regulations. The items dealing with the flying school rating of course show the effect of the new changes in pilot time requirements. The outstanding new factors are listed below.

Advanced Flying School Rating:

50.104. Flying Instruction Curriculum—Applicant shall show a flying instruction curriculum so organized as to offer the following courses of flight instruction:

50.1040 (a). Solo Pilot Flight Course—So arranged as to give each student a minimum of 15 hours total flying time, of which not less than 8 hours shall be dual or check time and not less than 7 hours of solo time in which the student is the sole occupant of the aircraft.

50.1041 (b). Private Pilot Flight Course—So arranged as to give each student a minimum of 35 hours total flying time, of which not less than 10 hours, nor more than 15 hours, shall be dual or check time, which may be credited as solo time for the purpose of qualifying for a pilot rating. The course shall also be so arranged as to give each student a minimum of 2 hours solo experience in flying at least one type of aircraft other than that used for primary dual instruction and at least 5 hours of solo cross-country flying, which shall include at least one flight over a course of not less than 50 miles with at least 2 full stop landings at different points on the course.

50.1042 (c). Limited-Commercial Pilot Course —Same as in CAR 50.1041, except that the total flying time shall be a minimum of 60 hours of which not less than 15 hours, nor more than 20 hours, shall be dual or check time.

50.1043 (d). Commercial Pilot Flight Course —So arranged as to give each student

50.10430 (1). a minimum of 175 hours total flying time, of which not less than 25 hours, nor more than 40 hours, shall be dual or check time, which may be credited as solo time for the purpose of qualifying for a pilot rating.

50.10431 (2). A minimum of 10 hours solo experience in flying each of two distinct types of aircraft other than the aircraft used for primary dual instruction.

50.10432 (3). at least 10 hours of solo flying in at least one type of cabin aircraft, of at least 4-place capacity, which shall be loaded with ballast to the approved gross weight for such aircraft during such flights.

50.10433 (4). At least 10 hours of solo night flying.

50.10434 (5). At least 10 hours of solo cross-country flying, which shall include at least one flight over a course of not less than 100 miles with at least 3 full stop landings at the different points on the course.

Which brings us to the remarkably new air traffic rules, to which the chapters from 60. through 69. are devoted. No one—not even the most carefree young birdman with his second-hand gilloppy or the hottest young service school product out to show his stuff to the home town—has ever argued against the theory that safety was worth almost any sacrifice of "freedom." Trouble has been, four or five widely divergent types of flyer, each bent on different ends and approaching his operations from a widely different point, have been barging around our sky. Last year the Bureau's first move to regulate non-scheduled flying under bad weather conditions over airways, met with clamorous protest from the private flyers who felt that the rules had been made by and for the air lines. The Army and Navy it seems had never really been properly approached with a plea for cooperation. Now the CAR regulations are presented as the result of dozens of meetings of representatives from all of these divergent groups. As a result the services have pledged themselves to regard each and every provision as rigidly as an airline with a Bureau of Air Commerce inspector sitting in the control office. Representatives from the non-scheduled flyers have asked for and received special levels in which their operations under certain conditions are amply looked after.

Some of the provisions at first reading are so new in their form and content as still to be difficult to grasp. The section starts off with a set of definitions which are fundamental to the new technique. There is a full definition of a flight plan and of an approved flight plan. A controlled airport is defined as "an airport on which or adjacent to which is a radio directional aid to air navigation . . ." A controlled zone is defined as the "air space above an area within a circle with a radius of three miles drawn from the center of a controlled airport . . ." There are further definitions of a controlled zone of intersection, of contact flight, of instrument

flight, of over-the-top flight. There is an interesting new designation of weather by classes. Crudely explained, Class C is weather good enough for contact flying at the specified airport. Class I is weather too bad for con-

(*Turn to page* 62)

Douglas Keeps Northrop Shut: Air Corps

enters long battle between management and C.I.O.

OUT OF A MAZE of tangled charges and counter-charges and complicated maneuvers by representatives of the C.I.O., the National Labor Relations Board, independent workers groups, Inglewood civic officials, and the Northrop and Douglas management, one thing became evident late in October. That was that the Northrop factory, closed on September 6th by order of Donald Douglas, would not be reopened until some fair and substantial basis is found for conducting relations between employees and management. During more than six weeks of maneuvering, which included more bewildering scene shifting than we have space to record, the Douglas management, parent concern to the Northrop plant, has held firm in its insistence that no further production be undertaken by the Northrop division until the workers find some method of guaranteeing protection against sabotage of planes in production, and until whatever workers body is named as sole bargaining agency is prepared to post a substantial cash bond to assure satisfactory performance of any contract entered into.

Early in the year an election among Northrop workers, following the Douglas-Northrop C.I.O. strikes in February, resulted in naming of Local 229 of the United Automobile Workers of America (C.I.O.) as the majority Northrop workers' group to deal with the Northrop management. Thereafter a contract was entered into between Local 229 and the Northrop management providing for pay increases and other concessions, and providing that no further strikes should be called for one year. At the same time the Northrop management reserved the right to deal separately with minority groups. This eventually proved unsatisfactory to the members of Local 229 and after considerable dissension a new election was authorized by the National Labor Relations Board. For this election, the N.L.R.B. ruled that only factory workers should be permitted to vote. thus eliminating all office workers, engineers, and supervisory personnel, a total of more than half those on the payroll. Of 1400 Northrop workers only about 700 voted and some 551 favored the C.I.O. union. Further dissension arose immediately and Local 229, through Charles Hollinshead, broke off all negotiations and called a strike. September 6th Donald Douglas ordered the Northrop division closed. Local 229 has so far continued to picket the plant, no effort to re-open has been made.

Mayor Darby, of Inglewood, in cooperation with worker's wives and independent workers, has made strenuous efforts to bring about a reopening; conducting a mail vote of former Northrop workers on a plan of guarantees against future irresponsible labor actions. This mail vote showed 552 favored such a contract to 291 who opposed it.

Complicating the situation is the fact that the Northrop Corporation no longer exists, having been absorbed by the parent Douglas Company early this year. Under such circumstances the current government orders for Northrop replacement parts are being filled directly by the Douglas Company from its main Santa Monica plant. Further complication results from official notification to the Douglas Company by Major K. B. Wolfe, U. S. Air Corps Representative, that no further Northrop-built planes would be accepted by the Army Air Service until satisfactory guarantees were given that past indicated acts of sabotage would not be repeated. In his letter Maj. Wolfe said:

"Inasmuch as the recent acts of indicated sabotage have not been satisfactorily explained to this office or the guilty parties apprehended, this office feels that the continued acceptance of airplanes for the government with the everpresent risk of a recurrence of such acts is highly dangerous to service personnel and government property.

"Approval of present methods of manufacture, the use of tools, jigs and fixtures, and inspection methods, as provided in Articles 4 and 35 of Contracts W-535AC-8323 is hereby withdrawn. Airplanes and spare parts now on contract with the air corps, manufactured under present conditions, will not be acceptable.

"The resumption of acceptance of airplanes manufactured on contract is dependent upon your ability to demonstrate to this office that each airplane is free from malicious tampering and of the highest degree of workmanship."

In the light of this letter it becomes obvious that any settlement reached between Douglas and any labor organization relative to re-opening of the Northrop division of the company, must be made subject not only to the approval of the National Labor Relations Board, but also to the Army Air Corps. Under such a set of circumstances it is doubtful if the Northrop plant will be placed back in production for a considerable period of time. In the meantime the Northrop workers are finding employment elsewhere, thereby dissipating the strength of Local 229.

Institute Sets New High

Students Throng C-W Classes

AN ALL-TIME enrollment record is reported for the month of September by O. D. McKenzie, registrar for the Curtiss-Wright Technical Institute of Glendale, California, with 102 men signing up with the school during a single month. Of this number 82 were resident students and 20 homestudy men. McKenzie, who has registered more than 1,200 students during his work with the Curtiss-Wright School reports enrollment is now at a new high.

Westerns Confer

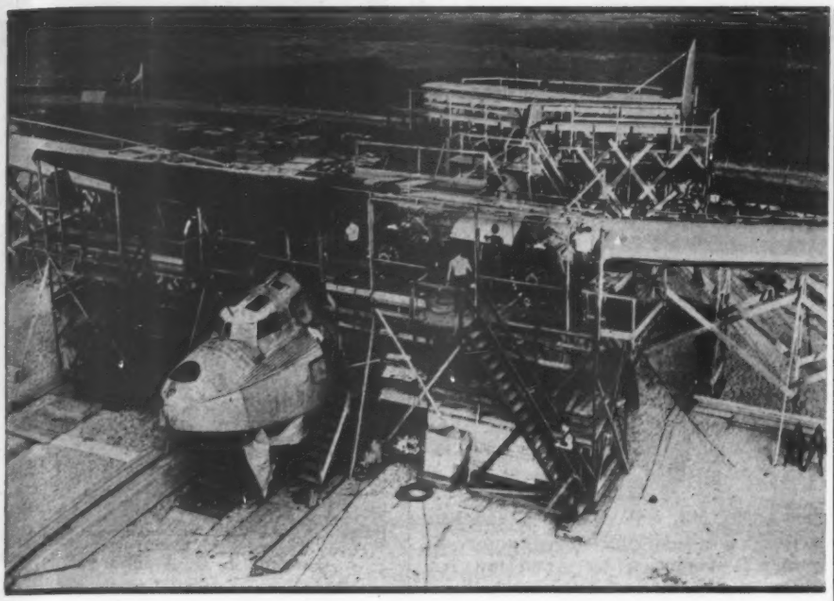
Lay Plans at Sacramento

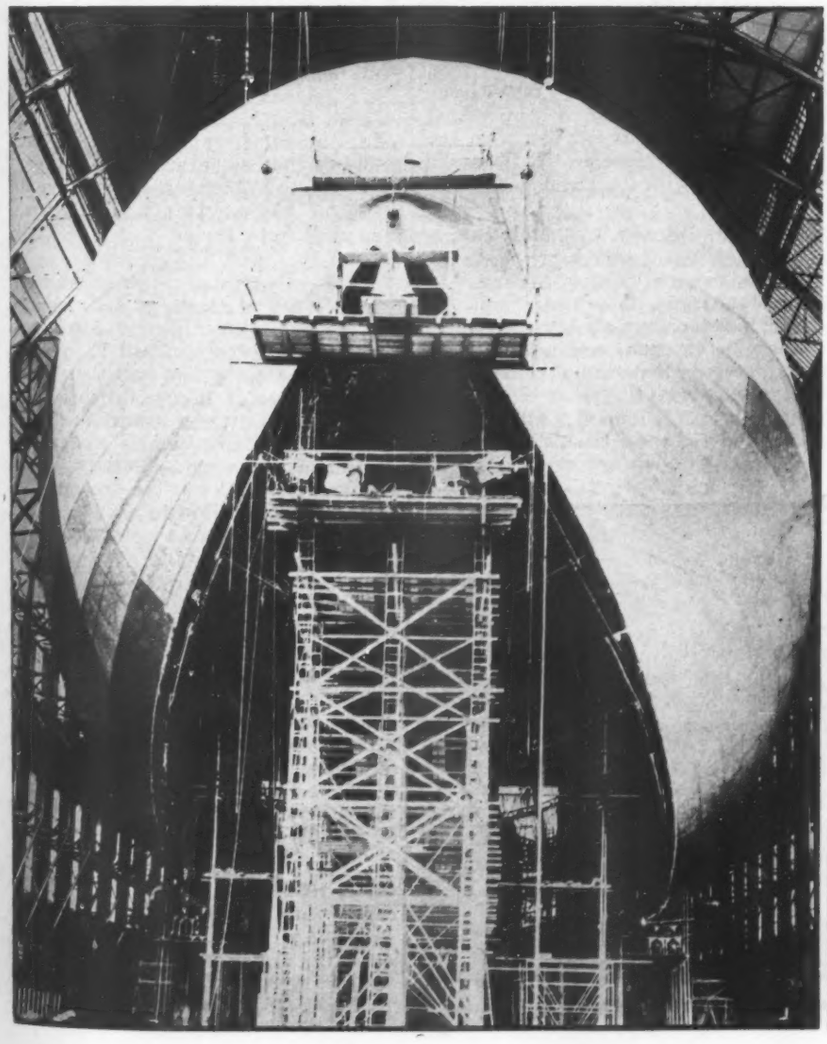
STRONGLY REFLECTING the growing tendency of the industry to seek mutual cooperation for solution of common problems, aviation leaders met in Sacramento, California, on September 23, 24, and 25 for an aviation conference sponsored by Frank F. Merriam, California Governor. Attended by governors of the eleven western states, and by leading aviation executives, the conference undertook to map a program for political approach to the current problems of civic and military aviation. In a total of nine sessions the problems of airlines, airports, private fliers, lighter than air, military aviation, aircraft manufacturers, aviation schools, and legislation relating to aviation were discussed by such speakers as: Col. E. S. Gorrell, Senator Patrick McCarran, Charles F. Horner, Col. Clarence M. Young, C. E. Rosendahl, Col. J. Monroe Johnson, Fred Fagg, Jr., Major General Oscar Westover, Rear Admiral A. B. Cook, Brigadier General H. H. Arnold, Brigadier General Delos C. Emmons, and others.

Welborn to Manage Spartan

Factory Speeds Production

IN LINE with production expansion occasioned by demand for its "Executive" model, the Spartan Aircraft Company, Tulsa, Oklahoma, has made several new appointments of personnel. J. W. Welborn is now Spartan general manager, C. H. Reynolds, Secretary and Treasurer, and J. H. DeCelles, Sales Manager. W. G. Skelly remains as president of the firm he founded almost ten years ago. Both Welborn and DeCelles act as test and demonstration pilots, in addition to their more formal duties, bringing to the company the full appreciation of flight problems and conditions which only seasoned pilots possess. Twelve "Executive" models have been delivered in the past few months, with production at three every 30 days. The first "Zeus" attack planes was delivered to the Mexican government late in September.





A STUDY IN SCAFFOLDINGS: Above, the huge 65,000 lb. flying boat built by the Glenn L. Martin Company for the Soviet government nears completion. A larger wing, flaps and more power give it 7,000 lb. more cargo capacity than Pan American's Martin Clippers. Below, the LZ 130 at Friedrichcshaven moves toward a launching next Spring. Extensive changes for helium have slowed its progress.

Stearman Names Dealers

APPOINTMENT OF TWO new Stearman-Hammond distributors has been announced by Lloyd Stearnman, president of the Sterman-Hammond Aircraft Company. Wm. Joy has been granted the distributorship for the state of Michigan, and A. S. Schacterle, of Philadelphia, has been named distributor for Eastern Pennsylvania, Maryland, Delaware, Southern New Jersey, and the District of Columbia. Both Joy and Schacterle took delivery on new Stearman-Hammond Model Y planes early in October and flew to their home bases for introduction of the new Menasco powered Model "Y".

L. A. Lifts Tour Lid

Club Flies to Modesto Meet

INAUGURATING its 1937-1938 Tour year, the Aviation Country Club of California staged a flight on September 18-19 from Los Angeles to Modesto, California, a distance of 285 miles. Some 75 club members participated, in 21 planes. Occasion for the visit to Modesto was the three day Modesto Air Show, with formation flying by military squadrons, stunting by Tex Rankin, a series of closed course races, and the establishment of a new solo refueling endurance record by Miss Evelyn Hudson. There were 144 planes on the field at one time and a crowd of more than 10,000 people turned out to see the show. Sixteen members of the Los Angeles County Sheriff's Aero Squadron attended in uniform, each flying his own plane. Flying from Sept. 16, to 18, Miss Hudson set the new record of 33 hrs. 9 min., surpassing the previous mark of 23 hrs. held by Norman Doerr, of Chicago. Miss Hudson took off with 36 gals. of fuel in her Aeronca plane, Miss Seaside, and made 44 refueling contacts under direction of Joe Plosser to get 82 gals. more fuel.

Solar's New Backlog

SOLAR AIRCRAFT COMPANY enjoyed a new record backlog of orders on hand as of October 1, according to a report by Edmund T. Price, president, who listed orders totalling $279,314.40. Although this total includes an order for 179 manifolds recently received from North American Aviation Corp., it does not include additional orders from the Glenn L. Martin Company which are expected to raise the total to more than $300,000. Production of manifolds and cowling parts for 1937 to Sept. 1 exceeded the entire production of the full year for 1936, and orders now on hand are sufficient to keep the plant busy at the current rate throughout most of 1938. Current orders are from Douglas, Lockheed, Consolidated, Sikorsky, Seversky, Spartan, and other major aircraft firms.

AVIATION PEOPLE

Who's Who in This Month's News

APPOINTED: DONALD A. DUFF, as traffic manager of the new Washington-Baltimore-Harrisburg-Buffalo division of Pennsylvania-Central Airlines. Since 1930 when he joined Pittsburgh Aviation Industries Corporation (subsequently purchased by Pennsylvania Airlines, Inc.), he has been Pittsburgh district traffic manager of Pennsylvania Airlines; manager of the Harrisburg Airport for Pennsylvania Aviation Industries Corporation; traffic manager for Pennsylvania Airlines' new Detroit-Grand Rapids-Milwaukee operation. In 1935 he was made advertising manager for the line, becoming director of sales and advertising for Pennsylvania-Central Airlines in 1936 when that company was formed. Headquarters: Washington, D. C.

. . . JAMES A. WEAGLE as chief engineer of Aeronautical Corporation of America, succeeding R. E. SCHLEMMER who has accepted a position with the Engineering Section of the Bureau of Air Commerce. For the past year Weagle has been assistant chief engineer, and his previous eight years in aeronautics were with Pitcairn Autogiro Company, Kellett Autogiro Company, and Keystone Aircraft Company.

. . . HERBERT V. THADEN as sales engineer in the Stainless Steel Division of Carnegie-Illinois Steel Corporation. From his headquarters in Pittsburgh, Thaden will undertake the technical and business development of stainless steel products for aircraft use. Fitting him for the job is his long experience in design, manufacture, and operation of lighter-and-heavier-than-air craft, and his recent consulting work on the economics of aircraft manufacture and operation. Thaden was at one time chief engineer of General Aviation Corporation.

. . . COMMANDER FRANK M. HAWKS as vice-president in charge of sales for Gwinn Aircar Company of Buffalo. Hawks demonstrated the plane at the Air Races in Cleveland (AVIATION, October). His record as an Air Corps instructor, transcontinental flyer, and record-breaker is an old story to AVIATION readers.

ENGAGED: MARY B. SCRIBNER, speaker, writer, and editor, as director of women's promotion by American Air Lines. She joins PAT O'MALLEY, director of publicity in the eastern division for the past eight years, and MALVINA PUMPHRY, member of the west coast publicity staff, in presenting the company's efforts to encourage feminine patronage.

. . . NANCY LOVE, as special sales representative, by Gwinn Aircar Company. Mrs. Love, wife of ROBERT M. LOVE (president of Inter-City Airlines, Inc. of Boston) will fly the Aircar about the country for demonstration purposes. In her former job with the Bureau of Air Commerce Mrs. Love did a similar job with the Hammond.

PROMOTED: COLONEL J. O. MAUBORGNE, to be Chief Signal Officer of the Army, with the rank of Major General. In 1912 Mauborgne, then Lieutenant, installed a radio set in an Army airplane, devised an antenna, and aided in the first air-to-ground radio communication. BRIGADIER GENERAL H. H. ARNOLD, then Lieutenant, piloted the plane, and COLONEL FOLLETT BRADLEY, then Second Lieutenant, was radio operator. Two experiments sending radio messages from an airplane in flight to a ground station, and directing artillery fire from an airplane, were successfully performed for the first time in history. Again in 1934, General Mauborgne, cooperating with Army flyers, conducted successful two-way radio communication between a plane and a ground station, working with a receiver and transmitting set he had built, installed, and operated—thus achieved another "first." For the past year General Mauborgne has been director of the Aircraft Radio Laboratory at Wright Field.

General J. O. Mauborgne

. . . J. A. HERLIHY, to succeed H. OLIVER WEST in charge of maintenance and engineering for United Air Lines. Herlihy, a graduate of M.I.T., learned to fly in the Navy and was then made chief engineer of Transcontinental Air Transport. Entering United's service as a pilot, he later became eastern division superintendent. RICHARD DOBIE, assistant chief pilot of the eastern division, takes over Herlihy's former job, and GEORGE GROGAN, eastern division pilot, becomes assistant chief pilot of that division.

GONE NORTH: H. OLIVER WEST, recently resigned as superintendent of maintenance for United Air Lines, to accept a post with Trans-Canada Airlines. West had been with United for the past eight years, and prior to that was an inspector in the Boeing Airplane Company. He is chairman of the inter-line Maintenance Committee of the Air Transport Association.

GONE HOME: THOMAS E. B. HOWE, recently appointed Air Commodore, Royal Air Force, to take over new duties as Senior Air Staff Officer and temporary Air Officer commanding No. 12 Fight Group, with headquarters at

Nancy Love and Commander Frank M. Hawks

Air Commodore Thomas E. B. Howe

Professor James M. Coburn

Hucknall, Nottingham, England. Air Commodore Howe has just completed a two-year tour of duty as Air Attaché at the British Embassy, Washington. In his zeal to better relations between British and American air services, he flew his own plane about the country, keeping in close touch with all aviation matters. His part in the negotiations for the establishment of the British-American-Atlantic service has been a notable one. Air Commodore Howe was with the Australian Imperial Air Force during the war, served as flight instructor at Cranwell, later in France. He will be missed by the industry. Replacing him is GROUP CAPTAIN GEORGE C. PIRIE of the Royal Flying Corps, formerly instructor on the Directing Staff of the Air Force Staff College, and for the past few years in the Operations Branch of the Air Ministry. He holds both the Military and Distinguished Flying Crosses.

RESIGNED: as president of Fairchild Aircraft Corporation at Hagerstown and from Fairchild Engine & Airplane Corporation, COLONEL JOHN H. JOUETT, to engage in consultation practice. Prior to joining Fairchild in 1936, Col. Jouett had been in the aviation department of Colonial Beacon Oil Co. In 1932 he organized the Central Aviation School in China. SHERMAN M. FAIRCHILD, president of Fairchild Engine & Airplane Corporation, takes his place as president of Fairchild Aircraft Corporation.

ADDED: EDWARD P. WARNER, to the staff of Norwich University (Northfield, Vt.), as special lecturer on the development and future of air transportation. His course of six lectures will be the first utilization of the endowment of $250,000 set up by GODFREY CABOT of Boston in 1935. Eventually the fund will be used to establish the James Jackson Cabot Professorship of Air Traffic Regulations and Air Transportation in honor of Mr. Cabot's son, a World War army aviator. PORTER ADAMS, president of the university and former president of the N.A.A., expects instruction in air transport to become a permanent part of Norwich's curriculum by 1938. Warner's papers will be made available to the industry and its scientific groups. An item in last month's AVIATION PEOPLE made it appear that Mr. Warner was a member of the firm of Poor and Wood. The association should have been described as one of collaboration only. Mr. Warner, who has his own consulting practice, and the firm of Poor and Wood will work together on problems of mutual interest.

. . . JAMES M. COBURN, to the staff of the Guggenheim School of Aeronautics at New York University, as Assistant Professor of Aeronautics in charge of the Air Transportation Department. Coburn, recently resigned as assistant chief navigation engineer for TWA, was with the Signal Corps during the World War, and later engaged in aerial photography and barnstorming. He assisted in developing the "Plane Speaker" for broadcasting from planes and was general manager of the Plane Speaker Corporation. His subject embraces the technical and practical training of air line personnel, with the object of developing men fitted for the eventual assumption of executive responsibilities.

. . . ATHELSTAN F. SPILHAUS, also to the staff of the Guggenheim School of Aeronautics at New York University, as Assistant Professor of Meteorology. Spilhaus was appointed to the research staff at M.I.T. in 1934, from there moved to the post of Assistant Director of Technical Services, South African Defence Force. Returning to this country in 1936 he carried on at research at M.I.T. under a grant from the Woods Hole Oceanographic Institution.

MOVED UP: E. S. TAYLOR, Assistant Professor of Automotive Engineering at M.I.T., to the rank of Associate Professor.

. . . MILTON J. THOMPSON, Assistant Professor of Aeronautical Engineering at the University of Michigan, to the rank of Associate Professor.

ELECTED: as officers of Chicago and Southern Air Lines: CARLETON PUTNAM, president; A. CULBERT, executive vice-president and treasurer; D. D. WALKER, vice-president-traffic and secretary. Last year's Board of Directors, composed of CARLETON PUTNAM, A. CULBERT, D. D. WALKER, BRUCE E. BRAUN, J. W. NEWEY, was re-elected.

JUST 20 YEARS AGO

AVIATION Reported—The death of Capt. Georges Guynemer while on a reconnaissance flight over Flanders. He had accounted for 52 enemy planes . . . An appeal for enlistments from the Signal Officers' Reserve Corps. Twenty thousand flyers would be needed to man "the great fleet the War Department intended to send to France." An official denied that "candidates are subjected to any nerve-wracking tests, as has been frequently reported" . . . A new American altitude record of 22,000 ft. set by cadet aviator Caleb Bragg in a Wright-Martin V biplane . . . A ruling by the Attorney General that the patent pooling agreement between the Aircraft Production Board and the Manufacturers' Aircraft Association did not violate the Sherman anti-trust law.

AVIATION Published—Articles on the shaping and finishing of propellers by Frank Caldwell . . . A description of the Austrian DIII Albatross Biplane . . . Standardized specification reports by the International Aircraft Standards Board and the Society of Automotive Engineers.

AVIATION Advertised—Curtiss, Burgess, L.F.W., Vought, Standard Aeromarine, Thomas and Boeing airplanes . . . Hall-Scott and Sturtevant engines (A want-ad listed a used 90 hp. Curtiss for $1,000) . . . Wyman Gordon crankshafts . . . Sperry incidence and banking indicators . . . Norma and Hess-Bright bearings . . . Goodyear kite balloons . . . Resistal goggles.

(*Continued from page* 57)

tact flying but still good enough for instrument flight. Class X washes them both out. These designations are going to become part and parcel of the nomenclature used in the new control technique.

Changes in general flight rules are slight. Interesting is the provision that planes flying below 2,000 feet in the neighborhood of a landing area must circle to the left, within a 3-mile radius of the field. Former regulations specified 3,000 feet rather than 3 miles. Under contact flight rules, which are quite new, there are more interesting new regulations than you could shake a control stick at. Minimum ceilings for contact flights over controlled zones are set at 1,000 feet by day, 1500 feet by night, and no flight can be made closer than 300 feet below an overcast. Another concession to the contact flyer is the provision that over-the-top flying may be done if limited dimensions of the undercast or broken stretches therein permit the flight to be flown with reference to the earth. Instrument flight rules are laid out in great detail for the non-scheduled as well as the scheduled flyer. They are too extensive and detailed to present here. In general effect there are no important changes from the regulations which have been in effect governing these two types of operations in the past, with the exception of the weird and wonderful, yet after all pretty simple conception of the green, amber, and red airway network traffic rules. They say it is quickly grasped by the use of a map, especially a map in which the various networks are laid out in colors. Cutting across verbal lots it comes out pretty simple too. It's just this—all the transcontinental air routes (and incidentally there are five of them) have been designated as green airways. East-bound one flies at odd-thousand foot levels on a green airline, westward at even thousands. With top precedence over the other colors you keep your altitude on a green network whenever you cross one of another color. Seven primary north and south routes have been designated as amber. On these a pilot flies northbound at odd-thousand foot levels, or heads southbound on the even-thousands. When time comes to cross a green network, you increase your altitude by 500 feet. Although you need to pay no attention to the red networks. The red network, which consists of feeder systems which are apt to take most any general direction follows the following rule. If the true course lies between zero and 180 deg. take an odd level. If between 180 and 360, travel on an even one. Add 500 feet to cross either amber or green. Simple, isn't it?

To date the rest of the CAR consists entirely of some seven chapters in the 90. group which carries the catchall title "Miscellaneous." Soon the 70. chapters will be out, dealing with air navigation outside the United States. The 80.'s have not yet been assigned. To return to the miscellany, one of the chapters gathers together a few regulations setting forth the skeleton of those factors which affect specifically air mail operators. Chapter 91. is a first grouping together of regulations covering accident investigations, specifying procedure by Bureau personnel, specifying who should sit on the board (3 officers or employees of the Department of Commerce, plus two disinterested persons experienced in aeronautics); setting forth regulations as to witness subpoenaes, testimony of investigators, etc. 92., 93., 94., 95., 98., and 99. seem to us laymen to be a sort-of bill of rights under which our relations with the administrators of CAR are conducted. Here are the fines and penalties which can be laid on us if we are convicted of violating its regulations. Here is how the Bureau will have to go about it, here is what we can do in our defence, here is how we may appeal the outcome—maybe. Oh yes! 99. is some more definitions.

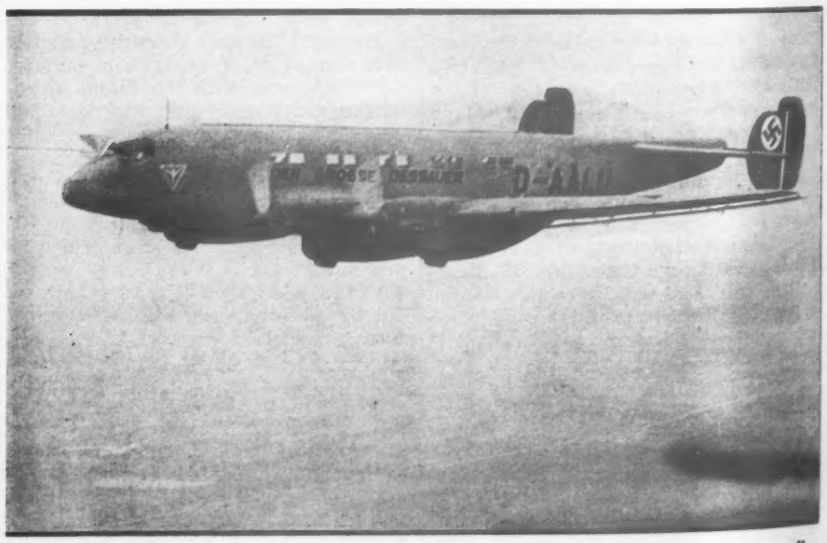
AS OTHERS FLY IT

A Birdseye-View of Aviation Abroad

The British are thumping the tub about their current export figures. Up to the end of August (eight months) British aeronautical products to the value of £2,050,252 (about $10,000,000) had been shipped abroad as against £1,676,866 (about $8,400,000) in the first eight months of 1936. Our own exports for only the first six 1937 months hit more than $16,000,000, but the British figures are astounding for a nation supposedly straining every production resource in a rearmament program. They are big enough in any case to tempt the Society of British Aircraft Constructors, Ltd., in claiming a position for Great Britain as "the leading supplier of acronautic material" in their official propaganda. Incidentally the Air Ministry has recently given Gloster Aircraft full permission for military shipments to China.

No one thinks much of France as a hotbed of civil flying—for years we have been saying, "Sure, the government spends beaucoup francs, especially on 'prototypes', but the French themselves don't go for flying." Yet a recent survey showed 2,332 civil aircraft registered with the French Air Ministry one for every 18,000 population. Compare U.S.; one for every 13,500). Of these 788 belonged to sportsmen-pilots; 784 to flying clubs; 260 to local operators; 222 to manufacturers; 108 to Air France; 11 to Air Bleu. Flying clubs increased in number during the twelve months preceding the survey from 208 to 279.

Other countries have crashes although to read some of the foreign press one would think they were an American monopoly. Officials of the British Air Ministry, for example, are deeply concerned over 101 fatalities in the Royal Air Force between Jan. 1 and the middle of this September—compared with 96 for the whole of 1936; intensified training is of course the underlying cause. . . . In September a transport of the Faucett Airlines crashed into a Peruvian mountainside under condi-



GERMANY ALSO: The new four-engined Junkers JU90, "Der Grossee Dessauer", takes the air in tests preliminary to service on Lufthansa's long runs. Seating 40, it is said to have a top speed of "at least 210 m.p.h."

Adopted by the

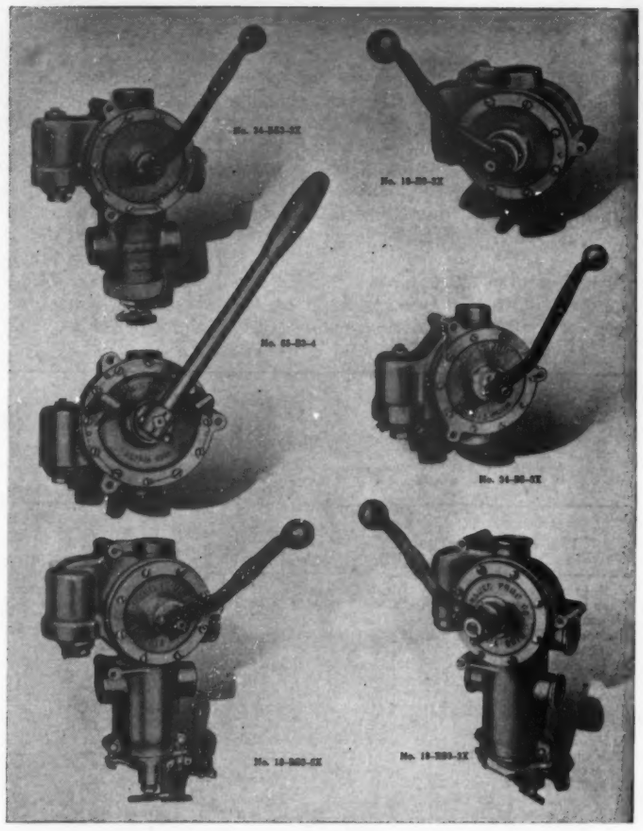
MAJORITY

of the

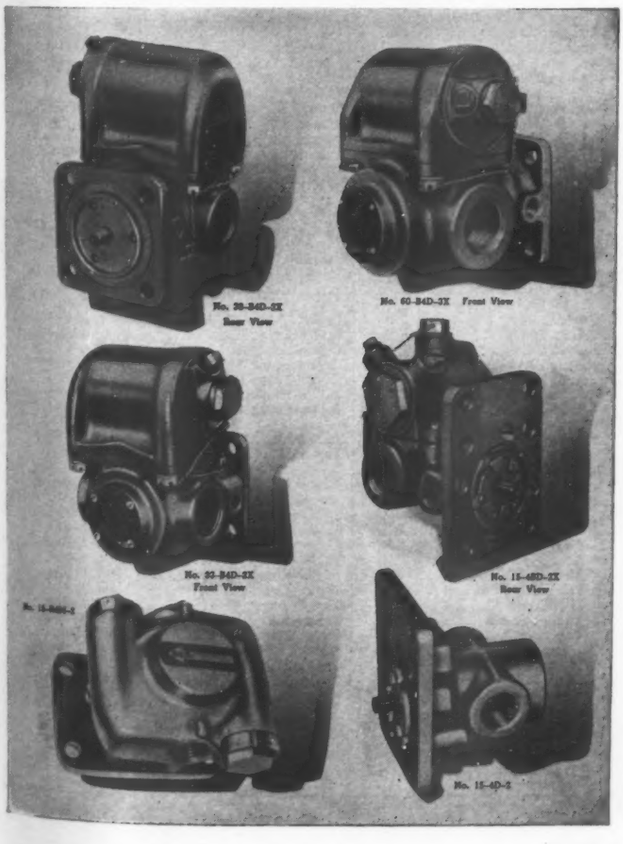
WORLD'S AIRCRAFT BUILDERS

and

OPERATORS



ROMEC DEPENDABLE FUEL PUMPS



The best evidence of dependability in aircraft fuel pumps is actual performance.

The strongest proof of that dependability is the adoption of that pump by the majority of the world's aircraft builders and operators.

Romec Fuel Pumps had to be good—they had to be most dependable in order to merit such widespread acceptance. Whether in long distance record-breaking flights at high altitudes or in steady daily transport service, ROMEC PUMPS are there with that definite, unqualified dependability of operation.

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tions of poor visibility, killing eight. . . . Oct. 1 an Imperial Airways Empire Flying Boat, the Courtier, crashed while landing in a fog on the harbor at Athens. Two were killed, five injured . . . Oct. 6 a K.L.M. plane crashed near Palembang, Sumatra, killing four, injuring Bronislaw Huberman, noted violinist.

Turkey wants 1,000 planes for its airforce and intends to have them by the end of 1939. Extensive orders have been placed in the U.S. (principally with Glenn L. Martin) and other countries. Flying schools are under construction throughout the nation.

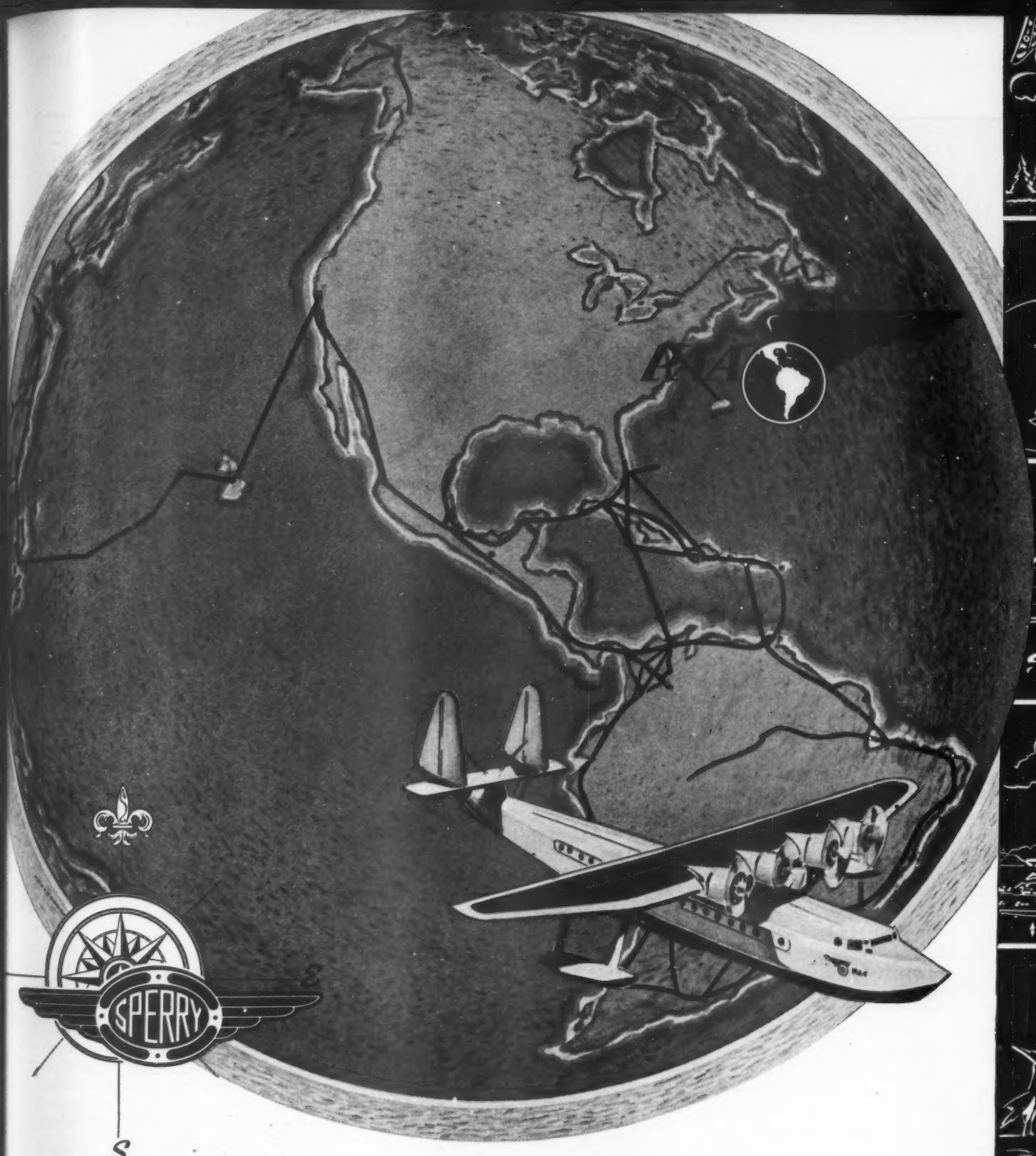
Air France has boosted fares on the London-Paris route, one of the best traveled air routes in Europe, from $16.15 one way to $19.95 thus bringing it once more level with Imperial Airways tariffs. Compare this approximate 10 cents-per-mile with the 5.5 cents-per-mile, the standard one-way charge on U.S airlines. Speaking of fares, Air France will also benefit by a new 39 cents per one-fifth ounce rate set for Argentine-European airmail. The old rate was 31 cents.

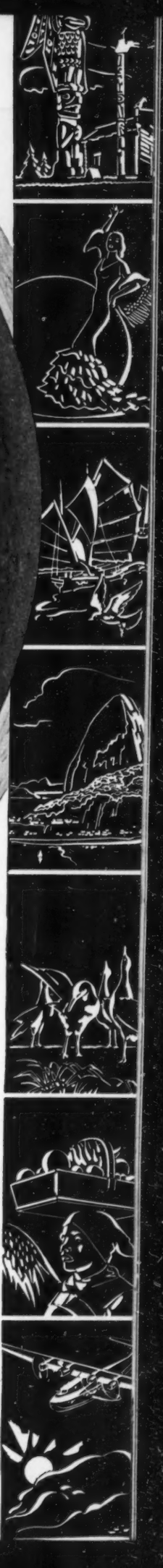
Who's got a good sport plane design? Sweden's largest shipbuilding concern, the Gotaverken Shipyards at Goteborg, wants a license to build just such aircraft for local and export markets. It is reputed to be already considering several American and other types.

COMMERCIAL DELIVERIES

AVIATION'S summary of airplane marketing for the month ended Oct. 1, 1937

Purchaser	Type of Buyer	Manufacturer and Model	Engine Make and Model
P. B. Pringle	Pvt.	Monocoupe 90a	Lambert R-266
Enan Pacha (Ex)	Pvt.	Monocoupe 90a	Lambert R-266
D. Lanhart	Pvt.	Taylor J2	Cont. A-40-4
Anderegg & Drapela	F.B.	Taylor J2	Cont. A-40-5
W. Potts	Pvt.	Taylor J2	Cont. A-40-4
D. H. Wallace	F.B.	Fairchild G DeLuxe	Warner S. S.
R. G. Jaekel	F.B.	Fairchild G. DeLuxe	Warner S. S.
Hooper Oil Co	Pvt.	Fairchild F-45	Wr. R-760-E2
K. Voelter	F.B.	Fairchild G DeLuxe	Warner S.S.
African F. S. (Ex.)	F.B.	Fairchild G DeLuxe	Warner S. S.
St. Louis F. S.	F.B.	Fairchild G De Luxe	Warner S. S.
C. Ketterer	Pvt.	Taylor J2	Cont. A-40-4
Boulevard A'port	F.B.	Taylor J2	Cont. A-40-4
P. Meinke	F.B.	Taylor J2	Cont. A-40-4
W. T. McGalliard	F.B.	Taylor J2	Cont. A-40-4
Republic of China (Ex).	Govt.	Beech D17R	Wr. 450 H.P.
Dr. S. Bosch (Ex)	Pvt.	Beech E17L	Jacobs L-4
H. E. Russell	Pvt.	Beech E17B	Jacobs L-5
G. C. Haven	F.B.	Taylor J2	Cont. A-40-4
8 to Southern A. S.	F.B.	Taylor J2	Cont. A-40-4
Clarksburg F. S	F.B.	Taylor J2	Cont. A-40-4
Bennett A. S.	F.B.	Taylor J2	Cont. A-40-4
4 to Airways, Inc.	F.B.	Taylor J2	Cont. A-40-4
W. H. L. McCourties	Pvt.	Stinson SR 8-B	Lyc. R-680-B6
F. Lombardi (Ex)	Pvt.	Stinson SR 9-ED	Wr. R-760-E2
Allen Av. Ltd. (Ex)	F.B.	Stinson SR 9-DD	Wr. R-760-E1
2 to Peoria A. S	F.B.	Taylor J2	Cont. A-40-4
13 to Aircraft Assoc.	F.B.	Taylor J2	Cont. A-40-4
J. D. Leachman	Pvt.	Taylor J2	Cont. A-40-4
H. S. McMann	Pvt.	Taylor-Young A	Cont. A-40-4
C. D. Peterson	Pvt.	Taylor J2	Cont. A-40-4
P. A. Meinke	F.B.	Taylor J2	Cont. A-40-4
Skorch & Syversen	Pvt.	Taylor J2	Cont. A-40-4
C. H. Jordan	Pvt.	Taylor J2	Cont. A-40-4
M. Cufflin	Pvt.	Taylor J2	Cont. A-40-4
J. A. Thiele	Pvt.	Taylor J2	Cont. A-40-4
E. P. Jacoby	F.B.	Taylor J2	Cont. A-40-4
Eyerly Aircraft	F.B.	Waco ZGC	Jacobs L-5
3 to Cuban Govt. (Ex)	Govt.	Waco UMF	Cont. W-670
Michigan A. Corp	Pvt.	Waco ZGC	Jacobs L-5
Central Aero. Corp.	F.B.	Taylor-Young A	Cont. A-40-4
Powers & Nixon (Ex)	Pvt.	Taylor-Young A	Cont. A-40-4
D. Hood	F.B.	Taylor-Young A	Cont. A-40-4
Howard & Watson	Pvt.	Taylor-Young A	Cont. A-40-4
D. L. Huscher	Pvt.	Taylor-Young A	Cont. A-40-4
R. L. Stout	F.B.	Taylor-Young A	Cont. A-40-4
A. B. Engle	Pvt.	Taylor-Young A	Cont. A-40-4
2 to J. L. Schroeder	F.B.	Taylor J2	Cont. A-40-4
F. A. Dugan	Pvt.	Taylor J2	Cont. A-40-4
G. Stanford	Pvt.	Taylor J2	Cont. A-40-3
Wiggins A'ways	F.B.	Taylor J2	Cont. A-40-4
Johnson F. S.	F.B.	Taylor J2	Cont. A-40-4
Houston Airport	F.B.	Taylor J2	Cont. A-40-4
Louisiana State Univ.	Govt.	Beech D17S	P. & W. 450 H.P.
Starratt A. & T. (Ex)	F.B.	Beech C17R	Wr. 450 H.P.
Barohana Co. (Ex)	Corp.	Beech D17S	P. & W. 450 H.P.
R. L. Johnson	F.B.	Taylor J2	Cont. A-40-4
Durango A'ways	F.B.	Taylor J2	Cont. A-40-4
Camel City F. S.	F.B.	Taylor J2	Cont. A-40-4
A'craft Enterprises	F.B.	Taylor J2	Cont. A-40-4
C. Hoenes	F.B.	Taylor J2	Cont. A-40-5
Badger A'ways	F.B.	Taylor J2	Cont. A-40-4
M. Conrad	F.B.	Taylor J2	Cont. A-40-4
3 to P. A. Meinke	F.B.	Taylor J2	Cont. A-40-4
Hubert & Dillon A. S.	F.B.	Taylor-Young A	Cont. A-40-4
E. A. Ellison	F.B.	Taylor-Young A	Cont. A-40-4
R. Nelson	F.B.	Taylor-Young A	Cont. A-40-4
Jennings & Perry	F.B.	Taylor-Young A	Cont. A-40-4
W. N. Raymond	F.B.	Taylor-Young A	Cont. A-40-4
Miro & Burns	Pvt.	Taylor-Young A	Cont. A-40-4
D. M. Creech	Pvt.	Fairchild G DeLuxe	Warner S.S.
Dr. T. McK. Downs	Pvt.	Fairchild G DeLuxe	Warner S.S.
J. Mills	Pvt.	Fairchild G DeLuxe	Warner S.S.
Pacific A. S	F.B.	Fairchild G DeLuxe	Warner S.S.
R. D. Clemson	Pvt.	Fairchild G DeLuxe	Warner S.S.
B. F. Haselton	Pvt.	Fairchild G Standard	Warner S.S.
J. C. Blatzell	Pvt.	Taylor J2	Cont. A-40-4
Pal-Waukee A'port	F.B.	Taylor J2	Cont. A-40-4
2 to Camel City F. S.	F.B.	Taylor J2	Cont. A-40-4
Strachan Skyways	F.B.	Taylor J2	Cont. A-40-5
N. Weber	F.B.	Taylor-Young A	Cont. A-40-4
C. H. Judd	Pvt.	Taylor-Young A	Cont. A-40-4
W. B. Barclay	Pvt.	Taylor-Young A	Cont. A-40-4
S. Mullikin	Pvt.	Taylor-Young A	Cont. A-40-4
7 to Jones & Humeston	F.B.	Taylor-Young A	Cont. A-40-4
Aviation Assoc	F.B.	Waco YKS-7	Jacobs L-4
Bennett Aircraft	F.B.	Waco ZGC	Jacobs L-5
L. Ensminger	Pvt.	Waco ZGC	Jacobs L-5
2 to Burnham-Miller F. S.	F.B.	Taylor J2	Cont. A-40-4
A. Honroth	F.B.	Taylor J2	Cont. A-40-4
Air Activities	F.B.	Taylor-Young A	Cont. A-40-4
Southern Airways	F.B.	Taylor-Young A	Cont. A-40-4
W. C. Breedlove	F.B.	Taylor-Young A	Cont. A-40-4
B. C. Britton	Pvt.	Taylor-Young A	Cont. A-40-4
D. B. Mommsen	Pvt.	Taylor-Young A	Cont. A-40-4
C. A. Brookes	Pvt.	Taylor-Young A	Cont. A-40-4
Jennings Bros	F.B.	Taylor-Young A	Cont. A-40-4
Miami Aero Corp	F.B.	Taylor J2	Cont. A-40-4
New Jersey A. S.	F.B.	Taylor J2	Cont. A-40-4
3 to E. W. Wiggins A. W.	F.B.	Taylor J2	Cont. A-40-4
G. Pierce	Pvt.	Taylor J2	Cont. A-40-4
J. J. Routh	Pvt.	Taylor J2	Cont. A-40-4
Livingston, A. W	F.B.	Taylor-Young A	Cont. A-40-4
Snow's Laundry	Corp.	Taylor-Young A	Cont. A-40-4
W. R. Franklin	F.B.	Taylor-Young A	Cont. A-40-4
D. Lapham	F.B.	Taylor-Young A	Cont. A-40-4
Montgomery & McGlathery	Pvt.	Taylor-Toung A	Cont. A-40-4
Erhardt & Lewis	F.B.	Taylor-Young A	Cont. A-40-4
2 to DePonti A. S.	F. B.	Taylor J2	Cont. A-40-4
A. F. Harvey	Pvt.	Taylor 2	Cont. A-40-4
Aircraft S. & S	F.B.	Taylor-Young A	Cont. A-40-4
G. Yoxtheimer	Pvt.	Taylor-Young A	Cont. A-40-2
State of Mich	Govt.	Stinson SR 9-B	Lyc. R-680-D6
R. A. Alger	Pvt.	Stinson SR 9-BD(C)	Lyc. R-680-D5
J. M. Rush	Corp.	Stinson SR 9-FD	P. & W. Wasp Jr.
H. H. Timken	Pvt.	Stinson SR 9-ED	Wr. R-760-E2
Cuban Navy (Ex)	Govt.	Stinson SR 9-DD	Wr. R-760-E1
Hylan F. S.	F.B.	Taylor J2	Cont. A-40-4
Taylor Aircraft Co	F.B.	Taylor J2	Cont. A-40-4
2 to Hangar Six, Inc	F.B.	Taylor J2	Cont. A-40-4
Okura Company (Ex)	F.B.	Fairchild 91	Wr. SGR-1820F-53
W. L. Graves	Pvt.	Fairchild G Standard	Warner S.S.
State of Penn	Govt.	Fairchild G Standard	Warner S.S.
M. Whitaker	Pvt.	Fairchild H DeLuxe	Ranger 6-390-D-3
Susquehanna S. S.	F.B.	Fairchild G DeLuxe	Warner S.S.
2 to Cub A'craft Ltd. (Ex)	F.B.	Taylor J2	Cont. A-40-4
A. C. Finlayson (Ex)	F.B.	Taylor-Young A	Cont. A-40-4
Cook & Baker	Pvt.	Taylor-Young A	Cont. A-4-4
Little Corp	F.B.	Taylor-Young A	Cont. A-40-4
H. S. McMann	Pvt.	Taylor-Young A	Cont. A-40-4
C. Becker	Pvt.	Taylor-Young A	Cont. A-40-4
R. McDaniels	Pvt.	Taylor-Young A	Cont. A-40-4
Confer, Woods & Thompson	Pvt.	Taylor J2	Cont. A-40-4
Cub Flyers	F.B.	Taylor J2	Cont. A-40-4
Sociedade Colombista (Ex)	Govt.	Stinson SR 9-DD	Wr. R-760-E1
S. Maxfield	F.B.	Stinson SR 9-BD (C)	Lyc. R-680-D5
State of Penn	Govt.	Stinson SR 9-BD (C)	Lyc. R-680-D5
J. F. Wilson	F.B.	Taylor-Young A	Cont. A-40-4
W. D. Mauk	F.B.	Taylor-Young A	Cont. A-40-4
E. S. Cox	F.B.	Taylor-Young A	Cont. A-40-4
Aircraft S. & S	F.B.	Taylor-Young A	Cont. A-40-4
Fox Valley F. S.	F.B.	Taylor-Young A	Cont. A-40-4
M. W. Alford	F.B.	Taylor-Young A	Cont. A-40-4
Aircraft S. & S	F.B.	Taylor-Young A	Cont. A-40-4
Tata Sons, Ltd. (Ex)	A.L.	Waco YQC	Jacobs L-4
J. Luro (Ex)	F.B.	Waco YKS-7	Jacobs L-5
Montgomery Sch	F.B.	Taylor J2	Cont. A-40-4
D. C. B. Dao (Ex)	F.B.	Taylor J2	Cont. A-40-5
R. Pedroso (Ex)	Pvt.	Taylor J2	Cont. A-40-5
F. Riet (Ex)	F.B.	Taylor J2	Cont. A-40-4
Nicaragua Govt. (Ex)	F.B.	Taylor J2	Cont. A-40-4
M. King	Pvt.	Taylor J2	Cont. A-40-4
J. W. Miller	F.B.	Taylor J2	Cont. A-40-4
A. L. Thomas	Pvt.	Taylor J2	Cont. A-40-4
Louisville F. S.	F.B.	Taylor J2	Cont. A-40-5





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CHINA *to* BRAZIL...

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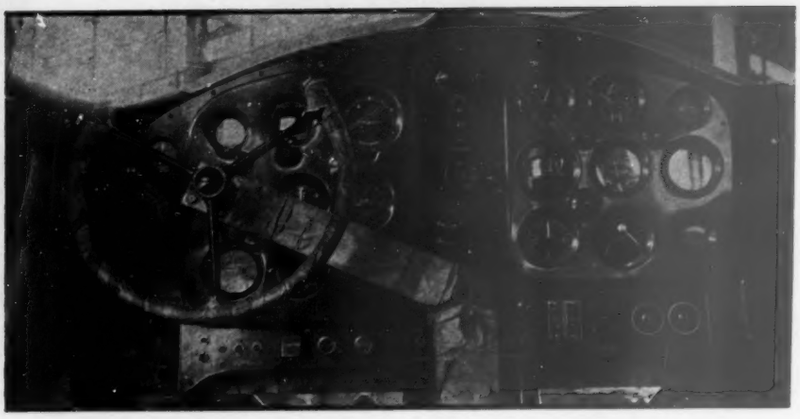


The instrument board is built to airline standards.

Spartan All Metal Executive

(*Continued from page 35*)

Flaps are all-metal, of dural sheet construction with Alclad covering and are operated both ways by vacuum, generous storage tanks providing for flap operation even with a dead engine. The full swivelling tail wheel is normally held in alignment by a light spring device. A streamline tailwheel fairing is optional equipment. Aerol shock struts are used on both landing gear main struts and tail wheel mounting. Landing gear is of cantilever type with wheels folding inward into the belly beneath the cabin. A simple actuating mechanism is electrically operated by means of an Eclipse retracting motor, the gear automatically locking in either extended or retracted position due to the passage of a crank past dead center, and against a stop. Goodyear wheels, tires, puncture-proof tubes, and hydraulic brakes are standard. Landing gear struts mount directly to the main spar.

Position lights and Grimes retractable landing lights are standard equipment, as are the four electrically operated flares. All wiring is installed in conduits and the entire plane is shielded and bonded for radio. Although radio equipment has not been made a standard item, every plane so far delivered has been fitted with a radio at the factory.

Great attention has been given to the instrument panel, which is practically a duplicate of a modern transport, being mounted on Lord bushings and including such items as turn and bank indicator, rate of climb, sensitive altimeter, manifold pressure gage, carburetor air temperature gage, Weston thermocouple unit, etc., as standard equipment. Also standard is the Hamilton-Standard controllable propeller, dual throw-over type Dep control, and Lux pressure fire extinguisher system.

Fuel capacity of 112 gals. is provided in two tanks mounted in the center section outboard of the cabin. Wing tips are quick detachable for service, inspection or repair.

From the service standpoint a major feature is the powerplant unit, which is built up on a separate jib before mounting to the plane. Great attention has been given to arrangement of the engine section for ease of access for routine servicing and for quick removal for overhaul. All electrical connections from the engine mount to the fuselage are carried through a single Cannon plug detachable at the firewall. Likewise, all plumbing carrying from the fuselage to the engine section is taken through a single panel where all lines are concentrated for neatness and accessibility. Solar exhaust manifold and heater stove is standard equipment. The oil cooler is mounted inside the engine cowl and supplied cold air by means of a tunnel from between two of the cylinders.

To carry three people on the rear seat, a rectractable half seat cushion is pulled up into place and the center armrest is extended into a comfortable back rest for the third passenger.

Specifications and performance.

ATC	No. 628
Engine	Pratt & Whitney 450 h.p. Wasp Jr.
Span	38 ft. 11½ in.
Length	26 ft. 9⅞ in.
Height	8 ft. 5 in.
Wing area	250.8 sq. ft.
Wing loading	17.5 lb./sq./ft.
Power loading	9.8 lb./h.p.
Gross weight	440 lb.
Useful load	1413 lb.
Passenger capacity	4–5 place
Baggage capacity	100 lb.
Fuel capacity	112 gal.
Oil capacity	7 gal.
Cruising speed (sea level)	190 m.p.h.
Cruising speed (altitude)	205 m.p.h.
Take off (sea level)	677 ft.
Take off (with flaps)	500 ft.
Landing speed (flaps)	57 m.p.h.
Initial rate of climb	1530 ft. per min.
Service ceiling	22,000 ft.
Absolute ceiling	24,000 ft.
Fuel consumption	22 gallons/hr.
Range (cruising)	950 miles (max.)

Standard Instruments (Pioneer or Kollsman)

Airspeed indicator, turn and bank indicator, rate of climb, clock, compass, sensitive altimeter, manifold pressure gauge, tachometer, engine gauge unit with oil pressure, oil temperature and fuel pressure, Weston thermocouple unit, Weston ammeter, A.C. fuel gauges, landing gear indicator lights, ice warning indicator, carburetor air temperature gauge.

Standard equipment:

Hamilton-Standard controllable propeller, Eclipse electric starter, Eclipse 25 amp. generator, Goodyear wheels, semi-air wheel tires, puncture proof tubes, and hydraulic brakes, Cleveland Pneumatic shock struts, navigation lights, Exide battery, Lux pressure fire extinguisher system, Solar exhaust manifold and cabin heater stove, heating system and cabin ventilation system, Lord rubber instrument panel bushings, dual throwover Dep controls, retractable landing gear, Ecilpse retracting motor, chassis warning horn, radio shielding, Grimes retractable landing lights, four 1½ min. flares, first aid kit, Seapak soundproofing.

Special equipment:

Hamilton-Standard constant speed control unit, Cambridge exhaust gas analyzer, Sperry Directional Gyro, Sperry Gyro Horizon, Radio receiver, radio transmitter, chair type parachutes, Romec vacuum pump for instruments.

Included in supplies and equipment standard on the Executive are: MacWhyte control cable, Fafnir ball bearings, Plexiglas, Parker plumbing fittings, Hayes tail wheel.

Rationalizing Aircraft Production

(*Continued from page 25*)

in progress. Drs. von Karman and Clark Milliken met with the group to explain some of the more advanced projects in wind tunnel research. Of special interest were the projects dealing with boundary layer investigation. Among other approaches to the boundary layer research was the special wind tunnel model soon to be tested, which is equipped with an electrically driven air pump to draw or blow the boundary layer off the wing while the model is under test in the tunnel.

Although dedicated to a spirit of Norwegian (or Scandinavian) gayety in the most approved Bill Stoutish manner, the annual banquet carried several constructively serious notes. Harry T. Woolson called these annual National production meetings a recognition of the outstanding position achieved by the Pacific Coast in the aviation industry. F. P. Laudan, in acepting the Wright Medal for himself and J. K. Ball and E. J. Minshall, of the Boeing Company, commented on the fact that the paper which had won this award was typical of the spirit of cooperation which had built the Boeing Company and was being manifested throughout the industry, as the paper was the work, not alone of the three authors in whose name it was given, but of many Boeing men who had contributed materially to its preparation and background. Wm. B. Stout, once he had disposed of a Scandinavian David and Goliath, settled down to a gripping discourse on the need of straight engineering thinking in the aviation field. He agreed with the comment made previously by E. R. Springer, of the Douglas Company, that most of the industry's problems could be solved by ordinary common sense intelligently applied, but commented on how uncommon it was to find any common sense to apply. He thought the aviation industry had been peculiarly blessed through a lack of production, which had permitted great engineering progress through frequency of change and originality of design such as is too often stifled by quantity production considerations.

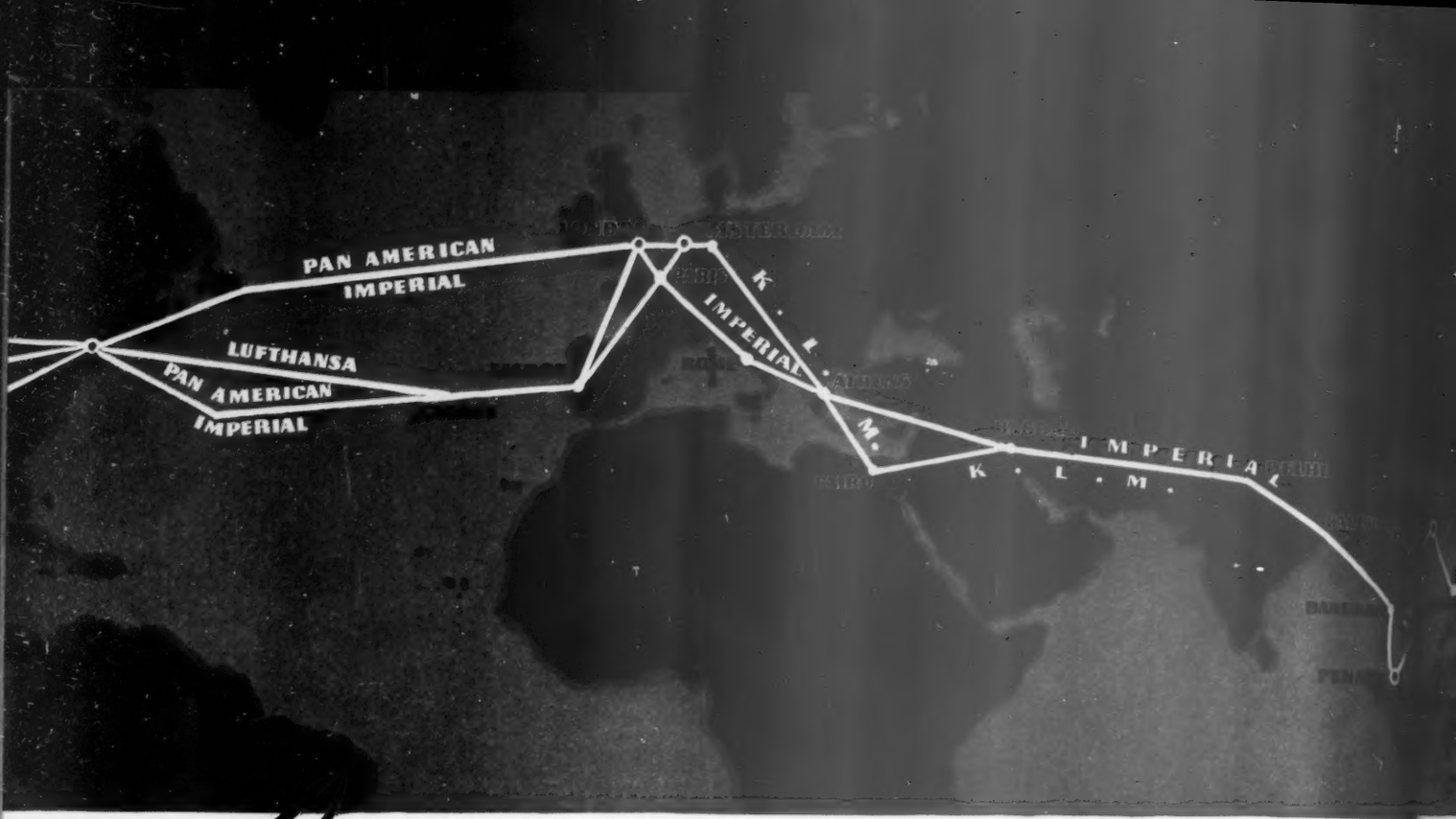
Highlight of the first technical session on Thursday morning was the paper by A. L. MacClain and R. S. Buck, Pratt & Whitney Aircraft Company, describing flight tests conducted with a new torque indicator which measures the reaction forces of the fixed gear in the propeller reduction gearing, giving true horsepower readings under actual flight conditions. Of great aid to the pilot in regulating mixture strength and controlling the engine power, it was predicted that this instrument would shortly become standard on geared engines. Adding about sixteen pounds to engine weight, in its present form, the device consists essentially of provision for floating the fixed gear in the propeller reduction gearing in such a way that the gear is free to rotate except that it is located by a device which transmits to an instrument a direct reading of the torque against the fixed gear.

A paper on the Design of Cowlings for Air-Cooled Engines, by Donald H. Wood, National Advisory Committee for Aeronautics, was read by Russell G. Robinson. The most voluminous paper of the entire meeting, this work, liberally supplied with diagrams and charts, brought hearers up to date on N.A.C.A. cowling work. Original N.A.C.A. cowlings were shown to have been crude indeed when compared with the current formula for approaching the cowling problem with a single equation incorporating both drag and cooling factors. Attention was directed to the necessity of baffles in connection with use of the N.A.C.A. cowl, and to the desirability of a flow regulating device such as the variable skirts now in use. This was likened to a valve controlling the flow of air through a pump, which is the function of the cowling in directing cooling air over the engine. Propeller effect was shown to be negligible, as the decreased nose pressure with a propeller operating at the front of a cowled nacelle was compensated by an increased suction at the trailing skirt due to the propeller air blast. A possible future development is the nose slot cowl, exhausting air in the region of high negative pressure near the nose of the cowling. This type has been found very critical but holds promise of improved cooling at low speeds. Present work is much concerned with the loss of efficiency in handling cooling air at the baffle exit after all useful cooling work has been done. It is thought that adequate cooling can be accomplished with only about 60 per cent the quantity of air and 20 per cent of the energy used at present. Little aerodynamic gain was expected from burying engines in the wing, as present designs with large wings and relatively small nacelles have shown little wing-nacelle interference.

As to in-line engines Mr. Wood indicated a strong skepticism concerning their promise of greatly reduced drag. On the basis of such in-line cowling tests as have been conducted to date, which are admittedly insufficient to point a definite trend, the in-line engine was felt to have shown no reduction in drag over radials of comparable horsepower. This scientific testimony takes on added interest due to its exactly opposite nature from the results shown by the past seven years of air racing, in which in-line powered planes have consistently shown greater speed than radial powered racers of equal horsepower. Obviously much benefit should result from further research into the cooling and cowling of in-line types. A practical suggestion was that manufacturer's engine type tests should more nearly stimulate cooling conditions of normal flight in order that the engine builder might supply more detailed data to the airplane designer for laying out a cowling that would best solve the drag-cooling formula. In closing it was felt that additional research on wing-nacelle interference is necessary. While manufacturers are not necessarily wedded to the radial engine type for life, nevertheless it was felt that this type possesses so many advantages, both inherent and acquired, that it looms large as a competitor for any other type engine which may be brought forward.

A paper on Engine Maintenance from the Operator's Viewpoint, by Walter A. Hamilton, of TWA, was presented by J. W. Vale, TWA Educational Director. Hamilton particularly commented on the fact that though present engines in airline use are required to develop greater relative horsepowers quicker and over longer periods than heretofore, that this is being accomplished with reduced inspection and maintenance. This is partially due to the five automatic functions now incorporated in the operation of airline engines: 1. Control of engine r.p.m.'s, 2. Manifold pressure control, 3. Engine air intake temperature control, 4. Mixture control, 5. Engine oil temperature control. It was reported that even considering mechanical delays of the most minor nature, TWA is now operating 37,000 miles per mechanical delay. Exhaust valves are now operating 3,500 hours before being returned to the manufacturer for re-heat treat-

(*Turn to page 76*)



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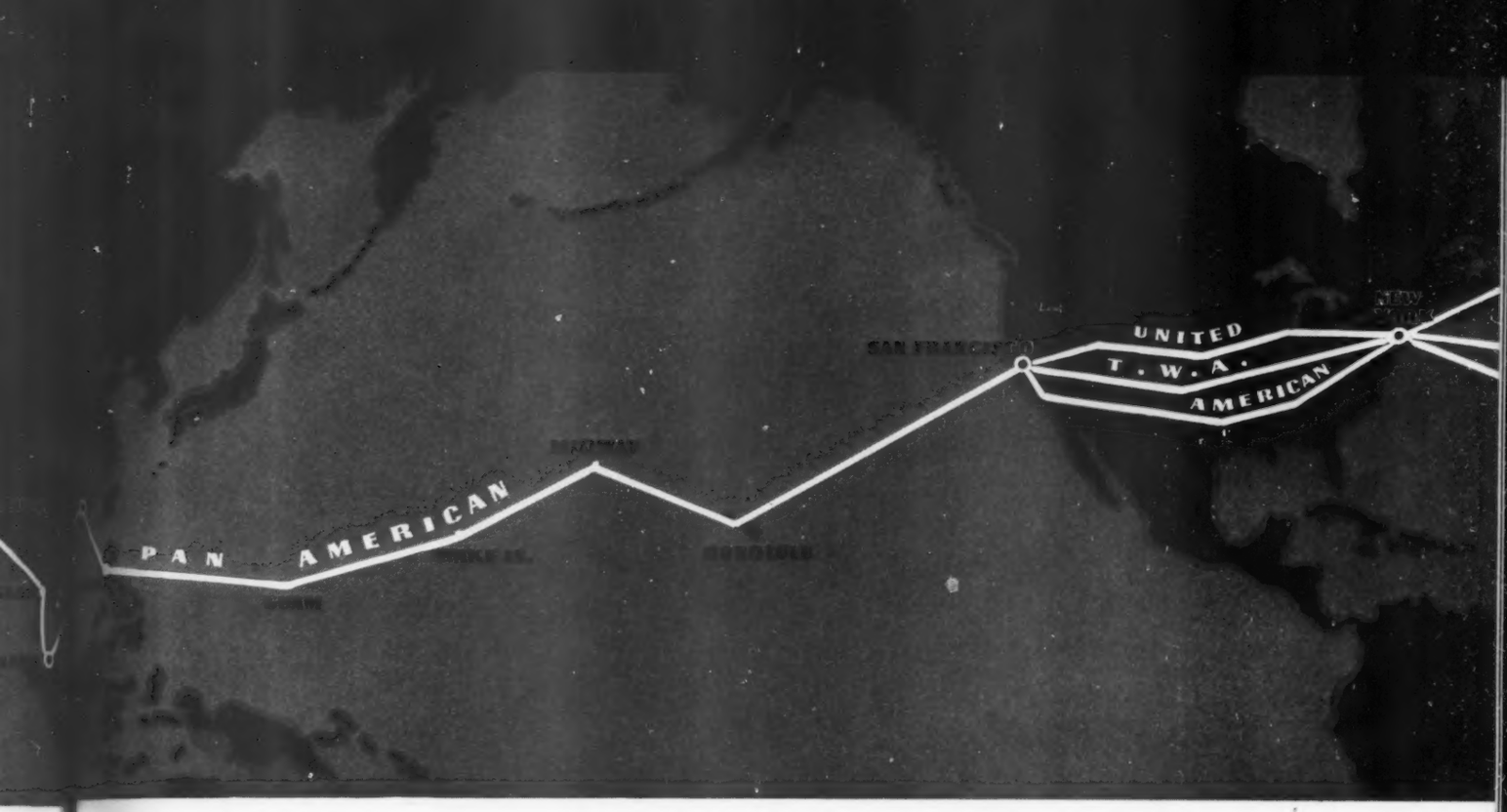

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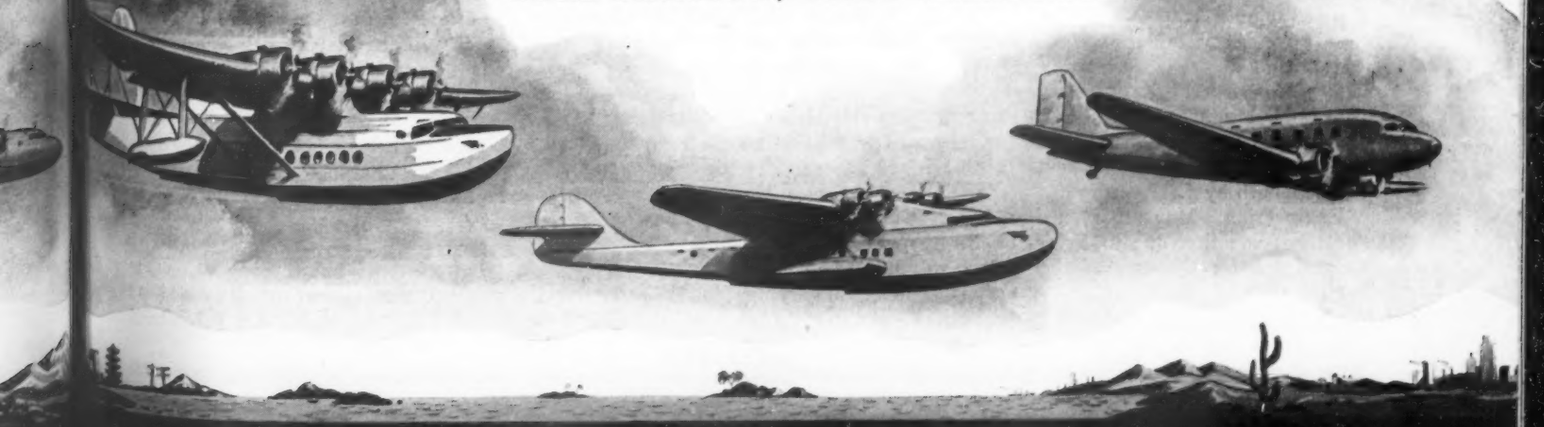

KORSKY FLYING BOAT ... American's Hornet-powered Sikorsky ... famous pioneers of both the Pacific ... North Atlantic routes. Also in routine ... from Hong Kong to the Philippines.

MARTIN CLIPPER ... Pan American's Twin Wasp-powered Martin Clippers ... now on their second million miles linking the U. S. A. to the Philippines.

DOUGLAS TRANSPORT ... Douglas DC3 Luxury Liners ... plying the airlines for United, TWA, American, and K. L. M.

Δt as an Element in Design

(*Continued from page 33*)

straight line extension of the lift curve completely independent of any behavior in the vicinity of the stall as normally measured. This matter of the presence of gusts becomes of increasing importance inasmuch as the strength of transport aircraft, at least, must be decided mainly by the estimated weather conditions.

Normally, all calculations of gust velocity and intensity, and the consequent accelerations are based on the sharp edged hypothesis which implies momentary inability on the part of the aircraft to respond to the aerodynamic effects imposed upon it. It is fairly obvious that the presence of viscosity in the air precludes the possibility of the sharp edged transition hypothesis from having a basis in physical fact.

Any ascending or descending mass of air must exert its influence on the surounding air and in return be acted upon by the pressure of viscous forces. There must always therefore be a gradient defining entry into a gust.

The abruptness with which a bump is always felt is no criterion of the sharpness of the gust, since, for a very moderate gradient, the maximum acceleration is reached in a very short space of time. This means that in steep but still definitely graded gusts, as they must be, the bump is felt practically instantaneously.

The gradient of the gust also will greatly affect the maximum normal acceleration and if we assume a gradient below a certain value it may be impossible to attain the acceleration produced by a finite sharp edged gust even if the graded gust eventually becomes infinitely great. It is necessary to assume that the airplane moves in a straight line while with the graded gust the assumption must be that the airplane responds to some degree at least to the aerodynamic forces imposed upon it.

It is possible to find the linear gradient law for a gust such that the ultimate accelerations is that produced by any designated sharp edged gust.

The matter of the possible gradient of a gust is discussed at considerable length by J. H. Crow in Aircraft Engineering, May 1937, using the general equation due to Professor B. M. Jones for the case of the graded gust

$$\frac{d\,(w + w')}{dt} + Z_w\,(w + w') = \frac{dw'}{dt}$$

where w is the vertical velocity of the airplane downward and w' is the gust velocity upward. Using the numerical values of 15 lb. per sq.ft. loading,

$$\frac{d\,C_L}{d\alpha} = 4.8$$

and a speed of 200 m.p.h., the time relationship for a 25-ft. per second gust is established as

$$w' = -90\,t$$

and the space relationship as $w' = -0.31\,X$, or about 1 ft. per sec. in 3 ft. It has also been shown that a time of only 0.6 sec was required to reach an acceleration of 90 per cent of the maximum value.

It appears, therefore, that, although flight conditions are normally taken as steady in establishing the stressing conditions, for two of the vital flight conditions at least, the conditions are extremely momentary, for which a somewhat different treatment might legitimately be required. This is also true for any accelerated case in which equilibrium is established by considering the mass inertia of the airplane. Consider, for example, an airplane in the act of landing in which a side load acts on one wheel only. In general, 90 per cent or more of the mass inertia of the airplane may be concentrated in the wings. The presence of a side force for any appreciable length of time will result in the attainment of an angular velocity and rotational movement of the wing tip. Since the rotation of the airplane is limited by the contact of the wing tip on the ground, members of the landing gear will be subjected to loads of extremely short duration whether or not recovery is affected.

Although the previous discussion demonstrates the fact that many critical conditions are necessarily momentary ones, it provides no evidence that they should be differently treated.

The amount of evidence that members behave differently under suddenly applied loads is scattered and unsystematic. The usual reaction to the suggestion that static strength may not necessarily measure strengths under momentary loads is to recall the text-book demonstration which proves that the stresses developed under impact are twice those under a steady load, but practical experience dictates otherwise.

Consider a steel tube which formed part of a large engine mount. The member was of streamline section heat treated to 95,000 lbs. per square inch ultimate tensile stress, having the following characteristics:

Size—3 O.D.—.065	$I = .22018$ inches^4
Length—63 inches	$= .6061$ inches
Area—.5993 inches^2	$= 104$
E (From tension test)	$= 28.6 \times 10^6$

This member, pin ended under axial load, was calculated to make good a stress of 26,500 lbs. per square inch or a load of 15,850 lbs. A certain amount of fixity probably existed at one end since at that end the pivot pin was arranged along the minor axis of the section. Experience with a similar case, however, indicates that the amount of fixity so attained is small. On actual test the strut was loaded to 17,440 lb., which gave a stress of 29,150 lbs. per square inch. Under this load the deflection at the center was approximately $\frac{3}{32}$ inch which gives a further stress due to bending of 14,850 lb. per sq.in., or a total 44,000 lb. per sq.in. Although the strut was not destroyed in this static test there was evidence for the belief that the maximum load had been reached, since it is a characteristic of Euler columns that, even while the stresses are low, after a certain critical load has been reached any further attempt to load the strut will result only in an increase in deflection with a consequent increase in stress, but with no greater resistance to axial loads.

The same strut was then loaded with a definite mass and dropped end foremost from increasing heights until failure ensued. Failure occurred at an acceleration corresponding to 22,400 lb. axial load in the strut as compared to the static strength of 17,440 lb. developed on test. This difference (29 per cent) is too great to be passed over, and if it could be considered to exist in all structural members could be used to advantage in design.

Practical experience tends to bear out the idea that momentary loads are less critical than static loads. High accelerations may be developed in a pull out by pulling swiftly back on the stick and then immediately shoving it forward again. As illustrated diagrammatically in Fig. 3, the result is a peak acceleration of high value and of short duration. As opposed to this, the stick may be drawn back until a high acceleration is developed and

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STINSON AIRCRAFT CORPORATION

Division Aviation Manufacturing Corporation, WAYNE (Detroit Suburb) MICHIGAN, U.S.A.

(*Continued from page 70*)

maintained by proper positioning of the stick. There is evidence to warrant the belief that momentary acceleration as in the first case may appreciably exceed the strength of the airplant warranted by static tests or by a maneuver of the second sort.

If further evidence warranted the use of say a 30 per cent increase in strength for certain members this would take care of such things as an overlift design condition, and would provide a definite margin for use with gust conditions.

It cannot be considered from this, of course, that all struts are necessarily good for a 30 per cent over load when loaded dynamically. Differences in materials as well as differences in geometrical proportions undoubtedly affect the capacity of structural members to take greater dynamic than static loads. With the increased use of monocoque construction, this characteristic may assume a still greater significance since monocoque construction is surprisingly elastic and capable of absorbing momentarily a large amount of energy.

Before any rules may be formulated for use in design and before any change in design requirements may logically be made, there is a real necessity for a test program to determine first the limits of the problem and then to determine actual behavior for use in design.

"Down Under"

(*Continued from page 31*)

predicament as the individual representative. They usually have no demonstrator to be shown, even if a sale has been made to a local buyer, because sport flying is almost wholly in the vicinity of the airport and long cross country trips are made only on rare occasions. The manufacturer may think he has South American representation but in most cases it is only local. At present, this may be sufficient, but for the future another system may have to be developed and used to take full advantage of the market.

ALL REPRESENTATIVES in South America have sales and operating problems quite different from those in the United States. In many instances, the manufacturer is not well acquainted with the representative, having had little business dealings with him in the past. In the case of the individual representative very likely the appointment was made through correspondence or the purchase of a demonstrator. The representative conducts his business by his country's standards and not by American methods. The manufacturer does not understand the representative's problem thoroughly, nor does the representative know the limitations of the factory. All of these things account for the confusion that exists in the export business as it is now conducted. To clarify the representative's side of the picture, the following list contains the major problems of selling aircraft in Latin America. Naturally, the entire list does not apply in total to each representative, but certain of the problems are common to all, whether or not they are individual representatives or an export company.

1. The bargaining instinct of the Latin-American, and the fact that practically every potential buyer insists on a discount and tries to buy direct from the manufacturer.

Explanation: In order to make this statement clear one must take into consideration the make-up and background of the average wealthy South American. He usually speaks English fluently, or if not, reads or understands English. He is well traveled, perhaps partially-educated in Europe and he has a very definite European background. He is perfectly aware that any imported article sold in his country will be fairly high in price, because in everyday purchases some import is included. He has been buying needed American and European imports for years and knows that in many instances the prices are exorbitant. In the case of purchase of aircraft he knows the f.o.b. price, the probable commission of the representative, probably knows the representative personally, and will make every effort to bring down the delivery cost. The representative also understands this and the merry-go-round begins. As an illustration, an extreme example follows: A potential buyer, wealthy, a member of a prominent family, and the owner of an American airplane in the light class had decided to graduate to a larger job. He also knew the representative personally. Instead of contacting the representative he contacted the factory, saying it was impossible to do business with representative. He wrote under the nom-de-plume of a former R.A.F. officer, offering to act as their representative, and at the same time making a cash offer to the factory for a delivered airplane slightly under the f.o.b. price. The factory, of course, backed the representative, but wrote in such a manner that the buyer had no alternative except to do business with the representative. After a considerable sum was spent in letters, cables and wires, the representative made the man a subdealer with a 10 per cent discount to close the sale, which was a mistake. The buyer immediately countered for another 5 per cent and the outcome of the deal was the purchase of a European aircraft at the terms dictated by the purchaser.

2. *Demonstrators:*—The writer knows of only three or four demonstrators (used in the sense of the word of what constitutes a demonstrator, and its availability, in the U. S.) between Rio—Buenos Aires, Santiago and Lima, as explained during the first part of the article.

3. *Cash with order*—The *average* economic set-up of a wealthy Latin-American is not a ready cash one. The wealth is usually tied up in property, business or industry. The young man of wealthy family, unless he has inherited his portion is still on allowance and under the control of the head of the family who is a paternalistic, dictator. This means two sales must be made, one to the family head, and one to the young man. The young man usually has an automobile, a good allowance and every advantage, but to dig down for the full price of an airplane is out of the question unless he controls his own money. Most commercial factories could be kept busy all winter if all the wealthy young Latin-Americans could get their hands on their probable inheritance. The comparison which can be made is that American automobiles are financed on as long as a 24 months basis to tap just this type of situation, which is out of the question in the case of aircraft. Fortunately, there are many other types of potential sales other than the individual and fortunately there are many individuals with their own money. There isn't a large business in South America which covers considerable territory with men, equipment or materials that could not use

(*Turn to page 75*)

Flight Companions

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some type of commercial equipment daily. The drawback is reliable pilots which again brings us back to individual buyers.

4. Exchange — For example, exchange and its effect on sales. Suppose South America manufactured aircraft and the United States did not—and you, as an individual, wanted an airplane. Suppose also, due to economic reasons our dollar, although good enough to buy food, clothes, and conduct business in the United States, had only a 1 to 15 value in South America. Suppose the price of the airplane was 3000 pesos or milreis—or $45,000 to you, in your dollars at that rate of exchange. Of course, the Latin-American is very familiar with foreign exchange situation and discounts the cost of imported equipment as something necessary, but 45,000 units of anything, even potato chips, is a lot of potato chips. There is considerable more to the exchange situation than the above explanation and its handicaps to sales, but the example given sheds some light on the matter.

5. Representatives' lack of operating capital:—If an export company conducts your business or an individual acts as your representative the situation is identical. The export company that has more than one demonstrator bought for the purpose, and being shown throughout its territory does not exist. The same applies to the individual. Usually when sales are made the buyer is appointed as an agent, if based away from the city or municipality where the representative operates. Sales are hard to make with only a catalog and price list, and the fault does not lie entirely with the export company or the individual representative. The export corporation probably takes care of all of South America, and the individual representative one country. If each type of representative placed demonstrators where sales could be made, or at least sale of the demonstrator, it would take considerably more financing than either would assume.

7. Crating and Shipping Costs—The amount charged by the factory for crating, even though labor and materials are high and the manufacturer thinks there is no alternative, is out of proportion and has always been a sore spot with the buyer.

8. European Competition—European competition is serious in one respect. It minimizes the characteristic fineness of American equipment by offering higher horsepower ratings, innumerable gadgets, less costly shipment with time payments, in many instances. The higher horsepower ratings although meaning nothing but more power to get it off the ground and keep the job flying has a peculiar attraction to a non-flyer or a novice. The writer remembers bets that were made on testing a float-equipped Fairchild 24 that it could not get off the water in two minutes, let alone carry four people with 145 horsepower, but this example of good design and fine equipment, of course, was not witnessed by all South Americans.

9. Lack of Translated Material—The individual representative works on a fairly small margin and if he based his living entirely on the sale of commercial aircraft his card at the hospital would read exhaustion from under nourishment. Luckily, the representatives usually are well-to-do or have an income from some other source. Translated advertising material is therefore neglected due to outside influence and the fact that he does not have to push aircraft sales to live. Some export companies may translate all advertising matter, but to my knowledge, it is left to the sub-agents who after all are individual representatives. It is not entirely necessary for catalogs to be in Spanish or Portugese, but the amount of good accomplished would offset cost of translating and printing.

The minor problems are:

1. Length of time for delivery—A situation that can be remedied only by pushing through the order more rapidly at the factory. When the buyer asks a delivery date and the answer is from one to two months enthusiasm is dampened considerably.

2. Assembly and Delivery service—Assembly is arranged for at the representative's base, which is usually at the major port of entry of a country, but if the buyer is located 1600 miles up the coast in the same country, who pays the bill for delivery, who delivers the airplane, and if the buyer is in a small city without a mechanic, where will he get his service?

3. Spare Parts—The spare part situation is partially taken care of up to and including the first top overhaul by the purchase of parts with the order of the airplane. Subsequent mishaps or needed parts rely on air mail and loss of operation for as long as three months.

There are whole and partial solutions to each of the above problem but the way to sales and a well ordered routine must start at the factory. The manufacturer that plans for sales south of the equator will be amply repaid in the future for the small amount of time and expense devoted to aid in the development of this fast growing market.

Automatic Power Control

(*Continued from page 39*)

If, when cruising on a weak mixture the pilot closes the throttle to the "slow running" position, the mixture selector lever is automatically moved to the "normal rich" setting, this obviating the possibility of the engine stalling on a weak mixture if opened up again.

The pilot can of course leave the mixture-selector lever in the "normal rich" position throughout the range of the throttle lever movement, which is an advantage for maneuvering at small throttle openings on the ground.

Constant Speed Propellers

Where constant speed propellers are used it is imperative that the control of mixture correction for altitude be entirely automatic and have "straight line" characteristics up to the ceiling of the airplane. Since therefore the mixture strength with altitude is properly controlled, and supercharge pressure is relative to the angular movement of the pilot's throttle lever, the setting of the constant r.p.m. propeller can be automatically achieved by a connection from the carburetor, instead of the cockpit.

As it is an advantage to have the ignition retarded for starting and slow running, advanced throughout the cruising range (where it aids economy) and retarded again under full power conditions, this is accomplished automatically by a connection from the carburetor and does not involve a control lever to the cockpit.

Ice Prevention

The Hobson-Swann ice eliminator is combined with the Hobson electrical ice-warning unit and provides fully automatic prevention of ice formation in the induction system. It does not require the use of heated induction elbows or the introduction of hot air, which frequently causes detonation and serious drop in power.

Rationalizing Aircraft Production

(*Continued from page 67*)

ment and further operation. This is partially due to the perfection of the automatic valve gear lubrication.

Robert E. Johnson, Wright Aeronautical Corp., aroused much interest with his comments on the Development of Successful Engine Installations. The three major factors in a successful installation were thought to be cowling system, lubrication system, and fuel system. Much work remains to be done on handling of lubricating oil, especially in connection with proper oil cooling. Fuel troubles were largely due to vapor lock and with high altitude operation approaching it was suggested that fuel coolers would be a necessary development of the near future.

Despite the most detailed design effort in the development of engine installations it was felt that exhaustive flight testing could not be neglected. Planes of twin engine type carefully designed for maximum single engine performance were found to lose an appreciable amount of horsepower when flown with one engine dead due to improper location of the carburetor air scoop with relation to the single engine operating condition. Much comment was raised at the conclusion of Johnson's paper as to whether the complete engine-accessory group, from the fire-wall forward, should be designed and built by the engine manufacturer, or jointly as at present. T. P. Wright, of Wright Aeronautical Corp., strongly favored having the engine manufacturer do the whole job. Dr. A. L. Klein, of California Institute of Technology and the Douglas Aircraft Company, suggested there were a number of seemingly insurmountable problems in connection with such an undertaking on the part of the engine builder.

In reporting on Engineering for Production in Stainless Steel, E. J. W. Ragsdale, E. G. Budd Manufacturing Company, gave many examples of the interesting methods developed by his company in applying stainless steel to railroad rolling stock design. He felt there was a promising field for this material in aviation but admitted costs to date were high. Discussion brought out the fact that England, long a leading exponent of steel construction, has now swung to aluminum sheet structures.

Eric Springer, Douglas Aircraft Company, gave a detailed report on Production Control as developed in the Douglas Aircraft Company.

Outlining procurement planning of the United States Army Air Corps, Major J. L. Stromme stressed the importance of preparing an adequate plan for the rapid mobilization of industry in time of national emergency. He reviewed the futile expenditure of 640 million dollars for American airplanes that never reached the front during the World War.

A paper on Quality Control of Aluminum Alloy Aircraft Castings by Kent R. VanHorn and Howard J. Heath, Aluminum Company of America, stressed the value of x-ray technique in perfecting foundry practices for the production of each new type casting. There is not yet available a satisfactory method for predicting the normal service life of a casting. Tests of specimens poured from the same metal as a lot of castings, or even of test sections sawed from a selected casting, were found inaccurate indicators of casting properties. It was suggested that any strength testing should be conducted with the casting as a whole. An examination of the service record of aluminum alloy castings in aircraft used showed that in ten years about 4,000,000 castings weighing about 3,000,000 pounds have been produced by the Aluminum Company of America, with a negligible number of failures being reported. Tom Triplett, of Triplett and Bartin, aircraft x-ray specialists, presented prepared comment and slides to illustrate the improved technique in casting examination resulting from use of a new type x-ray tube.

The rapid increase in the use of magnesium castings by the aviation industry was stressed by W. G. Harvey, American Magnesium Corp., in his paper on the manufacture, characteristics and uses of magnesium castings. Comment on corrosion problems revealed the fact that they are not generally as serious as some have thought, though the closest attention should be given to surface protection through proper treatment. Future developments are expected to include drawn and extruded sections of magnesium and formed sheet magnesium alloys for wider structural applications.

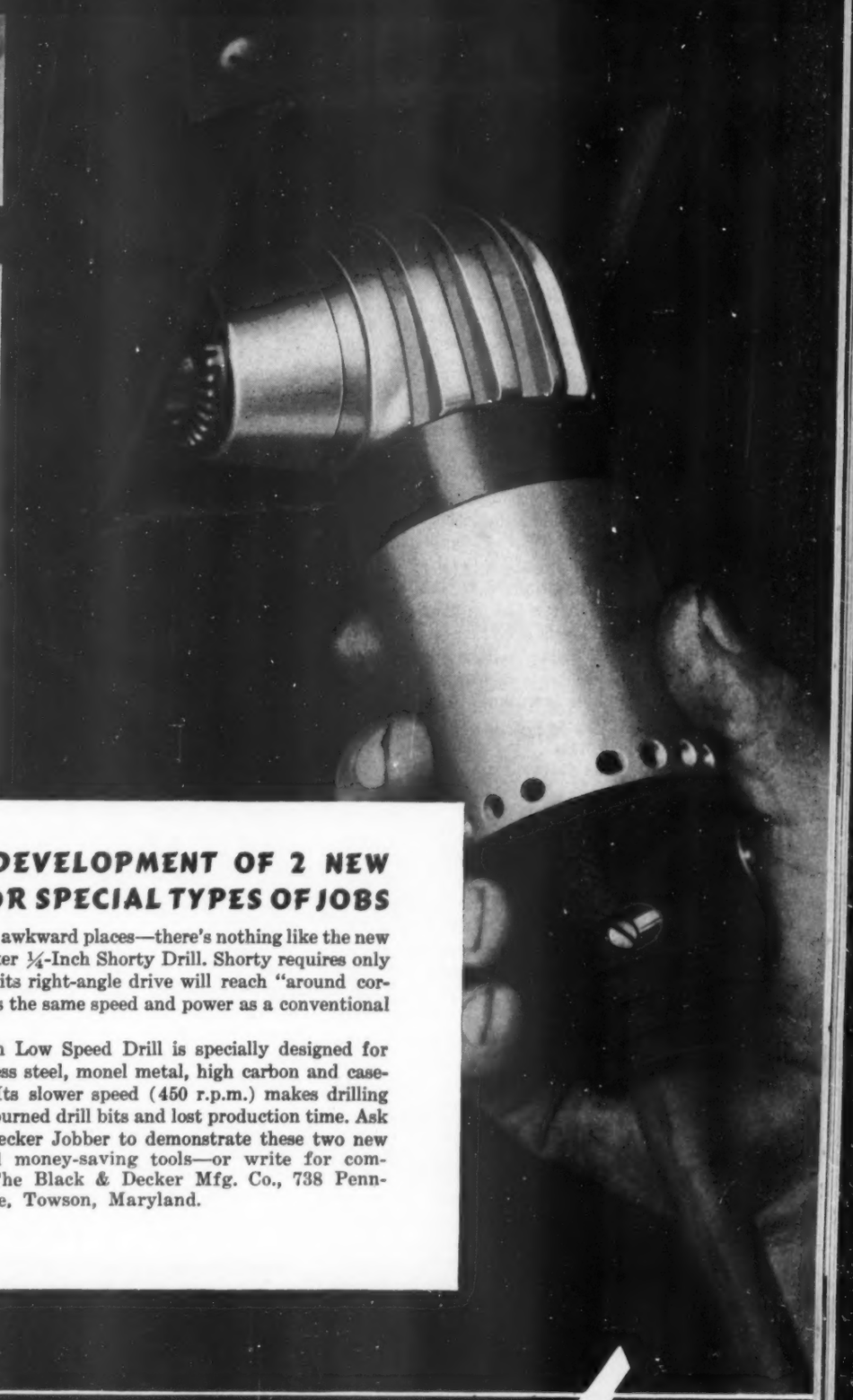
Latest developments in drop hammer technique were described by C. R. DeLaubenfels, Lockheed Aircraft Co., in a paper on Drop Hammer Applications. While the drop hammer is a useful tool, its application must be considered carefully in the light of production volume, die costs, and other available methods.

Desirable features of Plexiglas for aircraft use were stressed by G. P. Young, of Röhm and Haas Company, in his paper Plastics in the Aircraft Industry. Predicting much wider use of plastics in aircraft of the future, Young defined the two major types of plastics as thermosetting and thermoplastic, the former being capable of a chemical reaction when molded under heat and pressure which makes them thereafter incapable of being reformed through the repeated application of heat, whereas the thermoplastics soften under the action of heat and may be reformed. A disadvantage of the thermosetting plastics is that mold costs are prohibitive unless many thousand identical parts are produced. Applications of thermosetting plastics to aircraft use were given as: ignition system parts, control pulleys and cable guides, instrument cases, knobs of controls, molded panel boards, insulation in electrical switches and junction boxes, interior panel work and decorative fixtures. Thermoplastics are used in: windshield, windows and transparent enclosures, inspection panels, landing light covers, edge lighted instrument dial glasses, in solution as fabric finishing material (dope), in solution as a finish for leather upholstery, oil proof coating for ignition cable, drinking glasses, cup, plates, etc., lighting fixtures and decorative parts. Future application of large molded sections to aircraft construction is predicted.

In discussing Maintenance Problems of Army Airplanes, Major Joseph T. Morris commented particularly on the increasing size of aircraft, making it difficult to ship replacement parts, or to ship a dis-assembled plane back to the repair base after damage in the field. He hoped that manufacturers could devise planes which would come apart into sections small enough to come within standard railroad clearances. He also considered it necessary to further develop portable repair shops mounted on trucks in order that field repairs might be performed to an extent at least permitting flying a damaged plane back to the main base for complete repair. Overhaul costs now represent approximately one dollar for every five and a half invested in equipment, compared with one dollar for every three and a half dollars invested in a unit in 1932. It is be-

(*Turn to page 78*)

HELPING GOOD MECHANICS DO BETTER WORK



BY THE DEVELOPMENT OF 2 NEW TOOLS FOR SPECIAL TYPES OF JOBS

FOR drilling in awkward places—there's nothing like the new Black & Decker ¼-Inch Shorty Drill. Shorty requires only 4½" clearance—its right-angle drive will reach "around corners"—and it has the same speed and power as a conventional ¼-Inch Drill.

The new ¼-Inch Low Speed Drill is specially designed for drilling in stainless steel, monel metal, high carbon and case-hardened steel. Its slower speed (450 r.p.m.) makes drilling easier, prevents burned drill bits and lost production time. Ask your Black & Decker Jobber to demonstrate these two new time-saving and money-saving tools—or write for complete details. The Black & Decker Mfg. Co., 738 Pennsylvania Avenue, Towson, Maryland.

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PORTABLE ELECTRIC TOOLS

lieved that major overhaul costs on future planes will be due to repairs to landing gear, controls, and accessory parts. Importance of corrosion protection was discussed by F. G. Arnold in his paper on Effect of Design and Construction on Maintenance and Overhaul of Naval Aircraft. In all too few words this paper brought out the need of a complete understanding of maintenance and overhaul problems on the part of the original designer. In an informal talk accompanied by colored slides, John Leslie, Pan American Airways, discussed maintenance procedure on the Pacific route.

His paper on Factory Equipment and Tooling showed D. M. Carpenter of Consolidated Aircraft Corporation, to be an accomplished humorist as well as a talented engineer. Pointed comment drew attention to the peculiar nature of aircraft production, described by some authorities as "Hysterical production". Commenting on spot welding he thought the process had more limitations than adaptations. The number of rivets in a large modern airplane was approaching a figure comparable to the national debt. Aircraft production is a three ring circus. The customer is in the first ring spending sleepless nights injecting changes into the production picture until a design which started out as a training plane emerges from the factory as a long range bomber. The engineers, in the second ring, issue changes notices and new drawings enhanced with decorative trimmings with wild abandon. In the third ring the shop is trying hard to find out what the customer and the engineering department want built. Thereafter it must be built—economically if possible—but always in a hurry. Though the shop cannot originate design changes it finds a splendid weapon against smooth production merely by making mistakes. The whole performance is dominated by the cry for speed. Green "Rush" tags are used until every order in the shop carries a green tag. Thereafter the color scheme is changed to red for outstandingly urgent jobs. In commenting in detail on shop methods a caution was sounded against too ready adoption of "cost-saving" production methods. An analysis showed that a stamping, thought to be a real money saver, was actually costing more than the bench built assembly it replaced. Aluminum alloy scrap is quite a cost item. Some salvage was resulting from using aluminum scrap for hand form blocks, jig material, and for large tools and fixtures. Much metal cutting economy resulted from development of a new square shear designed by C. A. Van Dusen. Further efficiency and economy resulted from installing their own rivet making machinery. Now a rivet sorter to separate mixed odd sizes is much needed. An automatic rivet heat treat process has been developed for uniformity of results. Good work results largely from the use of good tools, and Consolidated is constantly seeking the best tools its purse will afford.

The closing paper of the 1937 meeting by Henry A. Berliner, dealt with European Aircraft Production Equipment. Aircraft, particularly military aircraft, are being produced in Europe on a scale surpassing anything we know. While they are producing aircraft components more efficiently than we, due to superiority of equipment, we are assembling the complete airplane more rapidly and efficiently due to superiority of American design, superiority of American skilled workers, and better materials. Aluminum alloy drop forgings, extrusions, sheets and castings are far better in this country than in any other. Much time was spent in describing a sheet metal forming process involving the stretching of metal sheets over wood dies, with some slight amount of hand hammering while the metal is in tension. It was apparently not known to the audience that this process has for some years been used to form float bottoms built by the Edo Aircraft Company. American and European tools were found to be generally similar. In Europe excellent results are being obtained with a unishear with extremely small blade, known as the Pels shear. Other unique machines are the wheeling machine, widely used in German factories in place of the power hammer; and the Stauchmachine, or Upsetting machine invented by the late Professor Junkers.

Out of a Hat

(*Continued from page 29*)

found in the normal aircraft manufacturing organization.

Our position was unique in that a transition to metal airplane construction for the military and transportation companies was not only abrupt but sizeable in scope. Men with metal experience were few. Our syllabus gave men just what was required of them by the military contractors. Men not absorbed into our own organization have been immediately accepted by the metal aircraft industry.

This demand for men has permitted our accepting candidates with less than two years of college training and to separate educational departments from manufacturing operations as well as justifying a continued augmentation of educational and scientific talent.

From the educational department men are selected and groomed for jobs in our organization, for our foreign associates, or for other manufacturers. Since the work is highly technical it is natural that some should fall by the wayside during the nine months instruction period, but better than ninety per cent of the men are absorbed by the industry. Thus our unique method of production and licensing affords opportunities for us to place men seeking experience. Thus the three phases of our activities interact to beat the thin market and the scarcity of skilled labor.

All of this did not come down like manna from a generous heaven. It represents a good many bedroom rugs worn in circular paths in the small hours of a good many early mornings. Our production methods are not miraculous, they are frightfully simple—but making them simple has required no less than three years of constant effort leading up to our present willingness to announce our readiness for the low-priced market.

We have succeeded in reducing welded parts to insignificent proportions. We dislike irregularities of welding. We can recall the early automobile with handmade, non-uniformed parts. Repair meant the employment of the nearest blacksmith. Compare that problem with the simple application of a machine-made standard part which any automobile dealer today takes down from his stockroom shelf. We aspire to an order of simplified field service with interchangeable die-cut sub-assemblies. And therein lies a tremendous reservoir of economy. There is not a great difference in the basic structure of our airplanes which will range in price from $1,500 to $18,000.

This in brief is what we are doing in West Trenton, New Jersey. We think we have found some answers to some problems that have puzzled the aviation industry since it started. And we are indebted deeply to the depression and to the kid's Meccano sets.

How High do you aim to go in Aviation?

A United Air Lines' Mainliner flies high over New York City

To men who look beyond just a "job"
BOEING SCHOOL of AERONAUTICS
offers the most complete range of aviation training courses in America

BOEING SCHOOL OF AERONAUTICS is a *career school*.

It aims to develop the type of trained men the industry wants as timber for positions of responsibility.

As the only U. S. *Approved School* owned and operated by a great airline (United), Boeing School is identified with over 125 million miles of airline experience. It gains further advantages through intimate contact with builders of aircraft and engines.

The teaching staff totals 30 specialists in the fields of design, manufacture, repair, flight, transportation communication, administration and commerce. These experts are veterans, with up to 24 years of experience. And at Boeing School the average is only 7 students to one instructor—*you get more hours of individual training.*

You work in an atmosphere of actual aviation activities. The school is located at United Air Lines' Pacific Coast terminus, the A-1-A Oakland Airport. Pan America's transpacific terminus is nearby—and there are 13 fields within a 24-mile radius. Flying weather is exceptionally good. And you have a *complete* range of 15 courses to choose from! Mail the coupon today!

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"AIRLINE PILOT and OPERATIONS" ...most famed of BOEING SCHOOL'S 15 "career" courses

The course for young men who wish to qualify as airline pilots—and rise to executive positions where flying ability and comprehensive technical training in all phases of aeronautics are primary requirements. Studies include 48 subjects; 260 hours dual and solo flying, advanced instrument and beam piloting, cross-country flight in 1100 h.p. transport. Most complete training available. Duration: 18 months. **6 other Boeing School Pilot Courses.**

7 Ground Courses . . . from 12-week "Aircraft Sheet Metal" course to 24-month "Air Transport" and "Practical Aeronautical" engineering courses.

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Department T-23 Airport, Oakland, California:
Please send BOEING SCHOOL BULLETIN without obligation to me (I'm interested in courses checked):

Courses requiring high school:
- ☐ Airline Pilot and Operations
- ☐ Transport *(or)* L. C. Pilot
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Courses for eng. grad. only:
- ☐ Airline Technician
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Note: Link Trainer Instruction available to students in all courses.

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International Air Show

CHICAGO

Jan. 28 to Feb. 6, 1938

Plan now to take advantage of the greater business opportunities of the coming year by exhibiting at the only Class A sanctioned aeronautical exposition in 1938.

Space has already been reserved for more airplanes than have ever been shown at any previous exposition in the country.

Chicago will be the focal point of the aeronautical industry on the occasion of this gigantic, most all-inclusive exposition of aero-manufacture and commerce in all of their phases.

Put your product in the floodlight of 1938!

Exhibit in this industrial congress that will mark new attainments and point to new progress in your industry.

Space Reservations Now Being Made

INTERNATIONAL AIR SHOW
INCORPORATED
MAYNARD W. SCHRYVER, Gen'l Mgr.
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SEE THIS EASY TO OWN PLANE

ONLY $1495* F. A. F. Alliance
$495 Down
Convenient time payments. *Deluxe equipment additional

Already, many are learning to fly their own Taylor designed craft — the world's most popular light airplane. New safety, new ease of flying, new low cost of operation opens the joy of the skyways to new thousands. In his latest achievement, C. G. Taylor, designer of over 66% of all registered light aircraft, offers you a truly modern plane which incorporates all advanced features — side by side seating, dual wheel controls, automobile type instrument panel, roomy cabin and baggage compartment and other progressive developments. Learn from your dealer, today, how easy you can buy and fly this spectacularly successful craft or write for full details.

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DESIGNED BY *C. G. Taylor*

TAYLOR-YOUNG AIRPLANE CO.
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When you want Men

put your advertising for them on the same basis as other publicity.

If you want competent and efficient executives or assistants, experienced in the field served by this journal, you will naturally find the keenest and most progressive men in the industry among the readers of this paper. You can get their attention through a Position Vacant advertisement or possibly find the man you want among the Position Wanted advertisers in

AVIATION "CLASSIFIED"

REFINISH YOUR PLANE CORRECTLY THIS EASY WAY!

Make sure of correct results *before* refinishing your plane! Berry's new Colorgraph Visualizer shows 190 combinations of Berryloid Pigmented Dopes just as they'll look *on the plane.* You can pick a decorative scheme for your ship with a flick of your hand—*and be sure it's the one you want!* Save time and disappointment! See the Berryloid Colorgraph Visualizer at your local repair base—or order one through Air Associates, Inc., or their jobbers and retailers. Price: five dollars.

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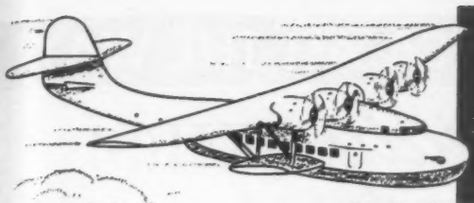
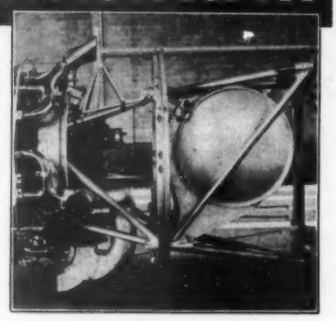
PAINTS • VARNISHES • ENAMELS • LACQUERS
DETROIT, MICHIGAN ★ WALKERVILLE, ONTARIO



KEEPING PACE
In Modern Construction

Following the policy of constant improvement in the finished product, "Ohio" again steps forward in applying the latest type of **Controlled Atmosphere Annealing** and **Normalizing** equipment to its present facilities for maintaining the established reputation of **"Ohio Special Quality" Aircraft Tubing.**

Thus, an additional factor of safety in aircraft construction is provided through the elimination of the former oxidized surface, leaving the surface clean, smooth and definitely scale free and surface bright, a decidedly better tube to inspect and weld.



One of "China Clipper" unique mountings of "Ohio Special Quality" Chrome Molybdenum Construction.

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SPECIFY: "Ohio Special Quality NON-OXIDIZED"

UNSHAKO

SELF-LOCKING NUT

**You put it on—
tighten it up—
and there it stays**

Vibration just can't shake it loose

It will pay you to find out all about "Unshako," the nut that can't work loose even when subjected to severe and continuous vibration —yet backs off readily with the aid of an ordinary wrench. It's self-contained—no separate pins or washers to be forgotten or lost. A built-in, self-locking ring or floating thread that works on the brake band principle, does the trick.

"Unshako" is the real solution wherever shock and vibration shake ordinary nuts loose. Can be re-used as often as desired.

Pat'd. & Pats. Pending

Fig. 1510 "Unshako" Self-Locking Nut

Cutout section shows the Locking-Ring in position

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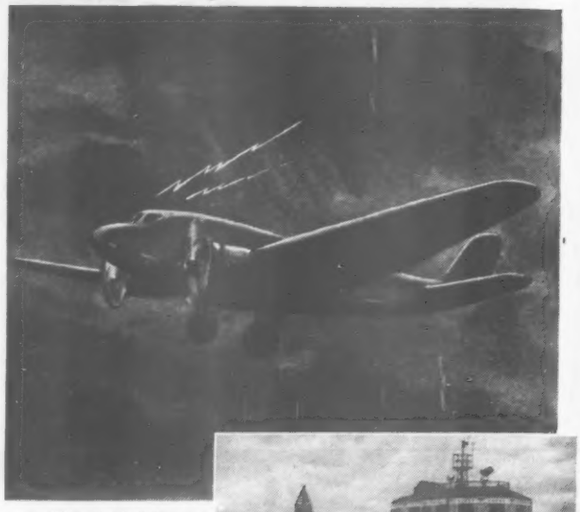

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November, 1937

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

Of Aviation, published monthly at Albany, N. Y., for October 1, 1937.

State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared D. C. McGraw, who, having been duly sworn according to law, deposes and says that he is the Secretary of the McGraw-Hill Publishing Company, Inc., publishers of Aviation, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

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(Continued from pages 83-84)

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Continued from pages 84-85 and 86

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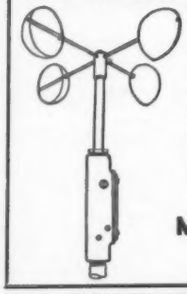

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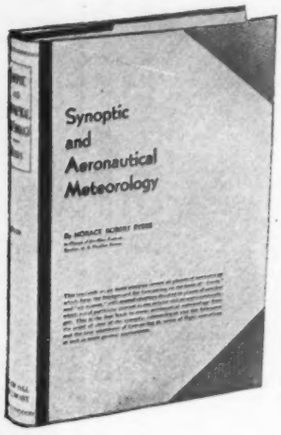

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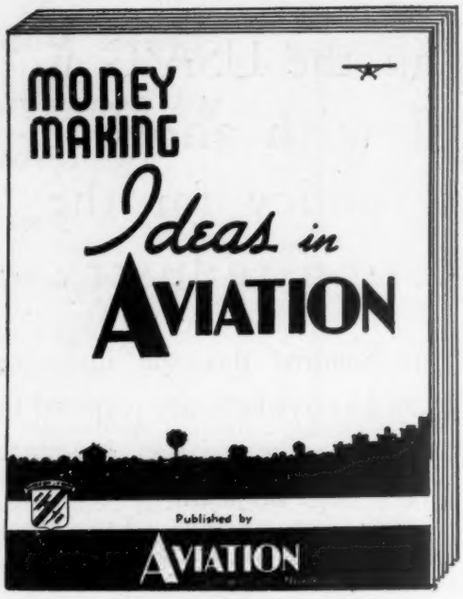

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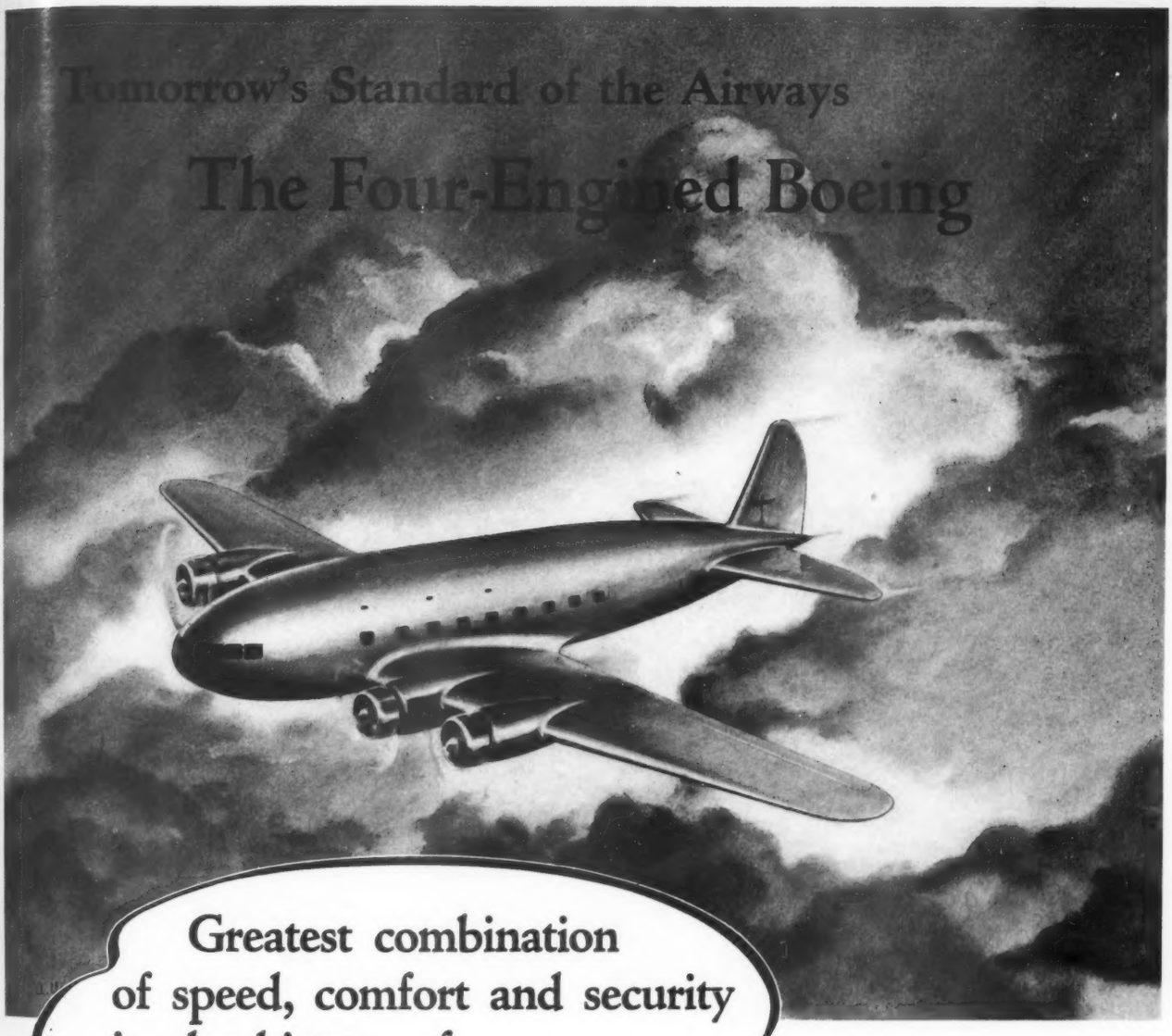

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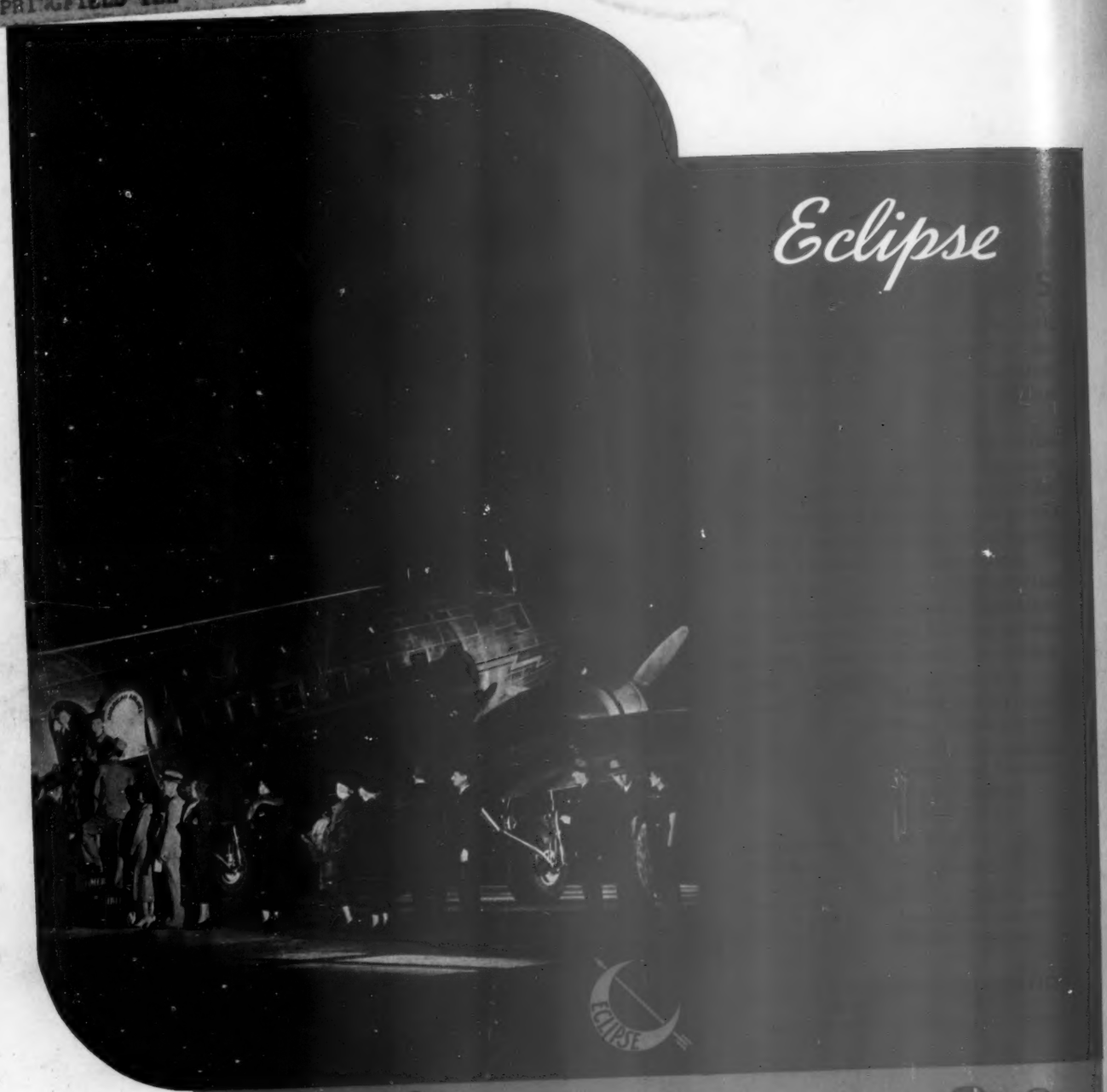

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Left: Eclipse Type Y-150 Direct Cranking Electric Starter — Approximate maximum engine capacity—145 H. P.